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TULAREMIA*

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THE fact that tularemia has been reported from many different sections of the country in the past few years and that it not infrequently escapes recognition for days or even weeks after coming under observation, makes it desirable that individual cases be brought before the attention of the profession.

Tularemia is a specific infectious disease due to the bacterium tularense. The causative organism was discovered and named in 1912 by McCoy and Chapin of the Public Health Service, and identified as the cause of a plague-like disease of rodents, epidemic among ground squirrels in Tulare County, California. Francis [1] of the Public Health Service, who has made an extensive study of the disease and has contributed many articles to the literature, believes that the first reference to the disease in humans was made by R. A. Pearse in a paper read before the Utah State Medical Association, Salt Lake City, October 3, and 4, 1910. It remained, however, for Vail [2] and Sattler [3] to observe the first human cases confirmed bacteriologically. These cases occurred in their ophthalmic practices in 1913 and 1914 and the bacterium tularense was isolated in cultures by Wherry and Lamb from guinea-pigs inoculated with the conjunctival secretions. In Utah, the disease in man was for several years known as "deer fly fever," owing to the belief that the infection was due to the bite of the blood-sucking fly (Chrysops discalis), commonly found on horses. This belief in the agency of the deer-fly was crystallized into demonstration in 1919 and 1920, when Francis isolated bacterium tularense from seven human cases and seventeen jack-rabbits and named the disease tularemia.

Tularemia occurs as a fatal bacteremia in various rodents, especially rabbits, and is transmitted to man by the bite of an infected blood-sucking insect or tic, or by the lodgement on the hand or elsewhere on the body of the blood or infected tissues of a diseased rodent, as may occur among marketmen, cooks, hunters or laboratory workers.

So far as is known tularemia is confined to the United States. It has been authentically reported from California, Utah, Wyoming, Idaho, Colorado, Ohio, Indiana, Tennessee, North Carolina, Montana, New Mexico, Virginia, West Virginia, the District of Columbia and Texas.[4] The two cases reported in this paper are from Maryland, the first as far as I am able to find, to be reported from this State.

* Read at the Joint Meeting of the New York Surgical Society and the Philadelphia Academy of Surgery, February 10, 1925.

In an analysis of forty-nine cases Francis describes two clinical types of the disease, the glandular type and the typhoid type.

In the glandular type the incubation period varies from two to nine days. The onset is sudden and manifested by headache, chills, pains, vomiting, prostration and fever. Following the local infection the patients complain within forty-eight hours after the onset, of pain in the area of the lymph glands which drain the site of infection, and on examination these glands are found to be tender and slightly enlarged. "The glandular pain precedes by about twenty-four hours any definite reference by the patient to the site of infection, which now becomes manifest as a painful, swollen, inflamed papule which speedily breaks down, liberating a necrotic core or plug and leaving an ulcer about one-fourth inch in diameter, with raised edges and having a punched out appearance. The fever lasts from two to three weeks, and may reach a height of 104° F." (Francis.) The temperature may be sustained or there may be daily remissions. There may be a lymphangitis as well as lymphadenitis. In about half the cases the lymph glands break down. In the other half the glands remain hard, palpable and tender for two or three months, gradually returning to normal.

The blood count is not sufficiently disturbed to be of diagnostic significance, although the leukocyte count may be somewhat increased. Agglutinins for bacterium tularense are absent from the blood during the first week of the illness, but appear in the second week, reaching their height at the end of the third or fourth week. They then begin to decline but persist somewhat for several years. Agglutination is of diagnostic value and makes possible the differentiation of tularemia from typhoid fever and other infections during the febrile period. Convalescence is protracted. It is rare for a patient to be at work again at the end of a month. The patients finally recover without evident complications, although some require from six months to a year. Weakness in convalescence seems to be a conspicuous symptom. Death apparently is rare, although several deaths have been reported in the literature.

Practically all cases of the typhoid type have occurred in laboratory workers and without evident site of infection or enlargement of lymph glands. In all other respects the disease resembles the glandular type.

Cases of tularemia have been erroneously diagnosed anthrax, glandular farcy, typhoid fever, septic infection and in one case in which slight jaundice was present, cholangeitis.[5] In our own cases one was diagnosed actinomycosis and the other bone-felon.

With a knowledge of the disease the diagnosis may be suspected on obtaining a history of contact with wild rabbits or of tick bite or fly bite, but cannot be absolutely established without laboratory aid. The serum of the patient after the first week gives a positive agglutination test which is reliable. Culture of the causative organism appears to be difficult. Inoculation of a guinea-pig with pus from the site of infection should produce death within a week with characteristic pathology. On examining the dead animal the lymph glands draining the area inoculated present a granular caseation. The spleen

is enlarged, and the spleen and liver are studded with great numbers of small white foci of necrosis.

The treatment is symptomatic. If the glands break down they should be incised.

The two cases I wish to add to those already reported were admitted to the Jefferson Hospital on January 5, 1926. Their histories are as follows:

CASE I.—B. J., a white man aged forty-five, an American, married, a farmer living at Girdle Tree, Maryland, on November 12, 1925 while cleaning a wild rabbit which he had shot was struck in the left eye by something which he described as "cool and soft." Thirty-six hours later the left eye became inflamed and swollen, discharged a purulent material and was very painful. He consulted a local physician who treated his eye and relieved the pain somewhat. Twenty-four hours later a lump developed in the parotid region. That day he had a severe chill followed by a fever which ranged between 101° F. in the morning and 103° F. in the afternoon and continued for about three weeks. He promptly developed lumps in the left submaxillary region. Lumps gradually increased in size, at first firm and hard, they soon softened and skin over them became glossy. They were sore to touch. Patient suffered much weakness and exhaustion from second day and after three months had not yet fully recovered his strength. He lost considerable weight. The eye condition improved slowly and gradually cleared.

FIG. 1.—Showing the enlarged and broken down parotid and submaxillary lymph-nodes.

Three weeks after the eye condition developed he noticed soreness at the base of the finger-nails of both hands and patches of skin eruption on the right hand and forearm. These gradually disappeared but traces of the eruption were still evident when he left the hospital. The patient stated that the flesh of the rabbit was normal in appearance and that it was eaten by himself and wife.

This patient was admitted to the Jefferson Hospital with a provisional diagnosis of actinomycosis. On examination the left eye showed a subsiding conjunctivitis. He had a fluctuating swelling about the size of a large marble in the left parotid region and three others of about the same size in the left submaxillary region. The temperature was 99.2° F. and the pulse 90. The blood examination revealed hæmoglobin 87 per cent., red blood cells 4,660,000, white blood cells 9800, polymorphonuclears 82 per cent., small mononuclears 16 per cent., transitionals 2 per cent. The Wassermann test was negative, the urine examination revealed nothing of note and the general physical examination showed nothing of importance. The spleen was not palpable. There was no general adenopathy.

C. J. Bucher, bacteriologist at the Jefferson Hospital saw the patient in consultation and on learning the history, at once suspected tularemia. On January 11 one of the fluctuating swellings was aspirated and yellow, purulent fluid obtained which on smears showed no actinomycotic fungi, but many pus cells. Doctor Bucher obtained a dead culture of the bacterium tularense from Doctor Francis at the Hygienic Laboratory, Washington, D. C. on January 13 and made an agglutination test which was positive. The patient's serum agglutinated bacterium tularense in dilution ranging from one in twenty to one in one hundred and sixty. The agglutination was complete in all tubes. On January 15, the broken down glands in the left parotid and submaxillary regions were incised and drained. There was very little discharge after incision and when the patient left the hospital, January 28, the wounds were practically healed.

A few days after admission to the hospital the patient's temperature and pulse returned to normal and remained normal until discharge.

Case II.—B. J., female, wife of preceding patient, aged forty-five was treated in the Surgical Dispensary. She had had an infection of the left ring finger which was healed when she came under observation. She gave a history of having developed a swelling of the left ring finger at the tip, forty-eight hours after her husband developed the infection of his eye. The finger at first was swollen, reddened and slightly painful. She shortly developed a fever which ranged between 100° F. and 102° F. for twelve or fourteen days. She had no chill. She felt weak and ill generally. Eight days after the onset she consulted a physician who made a diagnosis of "Bone-Felon" and lanced the finger. No pus was obtained. Three days later the finger was again lanced without obtaining pus. Two weeks later the left shoulder became sore and painful on movement. At about the same time the infection of the finger developed she noticed a lump about the size of a small marble to the inner side and above the left elbow. Although she had no abrasion on her finger she thought that she had developed the infection while attending to her husband's eye. The finger was never very painful. The swollen area did not have a black centre and did not ulcerate. On examination she had a healed scar at the end of the left ring finger such as one might see following incision for "bone-felon." There was an enlarged and slightly tender epicondylar lymph-node on the same side. Her temperature was normal. X-ray examination of the finger negative. Her blood serum agglutinated the bacterium tularense. She remained under observation until her husband was discharged from the hospital. The enlarged gland was diminishing in size and was no longer tender.

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TREATMENT OF ACUTE TRAUMATIC CRANIOCEREBRAL INJURIES*

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The outline of the proper treatment for acute traumatic craniocerebral injuries has not only always served as a general interesting topic for keen and lively discussion amongst surgeons, but also has more recently assumed a more important place in the life of the laity from the standpoint of industrial insurance. Very many of our present cases are found in workers covered by state compensation laws, and the question of the ultimate return to economic and emotional normality is a consideration of great importance not alone to the patient and his family but also to the insurance companies and the state. One can readily comprehend what losses are sustained each year by the families of the improperly treated injured and what additional burden is placed upon the state, social and charitable organizations. In view of these facts, the importance of the proper treatment of this type of injured becomes more immediate and momentous.

Surgeons have more or less always been considered by their medical brethren as the radical group of the profession. Our measures have appeared too drastic to the more conservative and watchful waiting physician. As a result of this criticism the surgeon has gone to the opposite extreme, and has become ultra conservative in too many instances. This, however, should be said for those intending to treat these cases; to be rationally capable of rendering these patients the best possible aid, the surgeon must acquaint himself competently with neurological principles. It is also helpful to remember this axiom that it is best to err on the side of radicalism and return a normal individual than to submit an injured to a permanent damage through the channels of conservatism. Radical treatment in competent hands at least obviates the danger of uncorrective, everlasting and irreparable trauma.

The question of saving life is not the all essential one in the treatment of head injuries, for what benefit is it to the individual if his life is spared if he has not been returned to economic normality? Or if he has been left so emotionally unstable as to require institutional care? The treatment of these cases should be directed towards the return of the pre-injured individual.

In this paper I shall confine the discussion to the treatment of the more common and immediate complications found in the acute traumatic craniocerebral injuries as they enter the hospital.

Fractures of the Skull.—Skull fractures are grouped into depressed fractures, linear fractures of the vault and fractures of the base. They may be free from or associated with the common, primary intracranial lesions, such

* Read before the Lackawanna County Medical Society, March 30, 1926.

as hemorrhage, cerebral œdema, cerebral contusion and laceration. It is very important to bear in mind that the fracture in itself, except certain types of depressed fractures, is of little consequence in the ultimate outcome of the patient. It does convey to the examiner the force of the blow exerted upon that skull necessary to have produced a separation in the continuity of bone. Formerly, the mere diagnosis of fractured skull spelled the gravest prognosis not alone to the laity but also to the doctor. If the patient survived, it was sometimes considered a miraculous accomplishment on the part of the physician, but more often as the result of an Almighty Miracle. Even at this present time, there are some men who erroneously lay great emphasis upon the presence of the fracture *per se*, depressed fractures being excluded from our consideration here. Juries will render verdicts with huge awards merely for X-ray evidences of linear fractured skulls. This is absolutely incorrect for the main issue in these cases has been overlooked, namely, the complications and the end results.

It is difficult to get these people to comprehend the mechanism of self decompression and to realize how fortunate a person really is with a linear fracture of the skull, whether of the vault or of the base, if a severe head injury is sustained. The force exerted against a skull sufficient to produce a linear fracture must of necessity be transmitted to the intracranial contents. It is true, on the other hand, that there is a water cushion or jacket of cerebrospinal fluid protecting the brain from such accidents, but in these cases where fractures are had, that protection is insufficient.

Depressed fractures, on the other hand, are at times of great importance in themselves. The skull in the adult consists of two tables with an intermediate diploe. If a fracture of the outer table alone has been produced without any associated intracranial pathology, the measures instituted are merely expectant and not operative. If the depression involves both tables regardless whether other cerebral lesions are present or not, that depression of bone must either be elevated or removed. Whether only the depression is operated upon alone or whether other procedures must be instituted before that can be safely accomplished, depends upon the presence or absence of associated conditions. If cerebral œdema is present, a preliminary subtemporal decompression of the type advocated by Cushing [1] with the straight incision must first be performed before the depressed area can be elevated or removed with perfect safety. Unless this safeguarding procedure of cranial drainage by means of the subtemporal decompression is employed, there is very great danger of cerebral herniation through the area of the elevated or removed depressed site with ultimate and permanent cerebral damage. If increased intracranial pressure is absent then the depression is alone treated surgically.

If intracranial hemorrhage is present along with the depressed fracture and there is no evidence of increased intracranial pressure, the hemorrhage can be drained by repeated lumbar punctures [2] and the depression is treated surgically, but if there is no tendency for the hemorrhage to be drained in this manner within four or five days, it is wiser to decompress the individual sub-

temporally and drain the extravasation by the more effective cranial route and to treat the depression next, otherwise a certain amount of chronic cerebral œdema with emotional and mental instability [3] may result from the interference with the excretion of the cerebro-spinal fluid. This fluid is absorbed by the supracortical veins, venous sinuses and Pacchionian bodies, but 80 per cent. of it is through the supracortical veins, and if the hemorrhage in its absorption leaves behind a layer of white film of organization residue coating these venous stomata of exit, it is readily seen how a stagnation can be produced and a chronically increased intracranial pressure exerted upon the brain. Both operations can be performed at one sitting and are easily done under local anæsthesia. One word in regards to the decompression operation itself. A decompression is not a decompression unless the dura is incised widely and left unsutured, in fact, it is impossible to resuture the dura with perfect approximation in these cases.

Linear fractures of the vault without displacement of the fragments is *per se* in all cases an adjunct in the treatment of acute traumatic craniocerebral injuries. It is a method whereby nature attempts to decompress itself and permit the increased amount of œdema to escape into the tissues for absorption. In these cases where the clinical signs do not manifest any indication of cerebral compression, the treatment is symptomatic and expectant. If the line of fracture should pass through the facial canal, peripheral facial paralysis may occur as a result either of direct traumatic severance of the nerve or of œdema of the nerve in the canal. The auditory nerve coursing the same aqueduct may also be involved.

Where the line of separation caused by the fracture is insufficient to overcome the increasing cerebral compression by the rapidly forming œdema, several justifiable methods of treatment may be utilized to reduce the swollen brain. These will best be discussed under the heading of the treatment of cerebral œdema.

Similarly, intracranial hemorrhage, when associated with linear fractures, will be treated in a future paragraph.

Fractures of the base of the skull are considered in the same light as linear fractures; there are no measures directed primarily to the fracture itself. The treatment is that of its complications which will be fully outlined further on in the paper. There are, however, these added features in basilar fractures. With fractures of the anterior fossa a cerebrospinal rhinorrhœa may be present if the line of fracture extends into the cribriform plate. This is a very effective method of decompression not alone in cases of craniocerebral injuries but also in some cases of cerebral neoplasm.[4] When the fracture is in the middle fossa, the decompressive exit is through the external auditory canal, which at times may be sufficient to ward off any complicating dangers. Posterior fossa fractures are very often apt to produce a cerebral œdema which is not only rapid in its formation but also drastic in its effect upon the medulla in that infratentorial compression hastily passes

through the stages of medullary compression into that of œdema where surgical treatment is contraindicated.

Concussion.—Concussion is a condition which we freely discuss but concerning which we know very little pathologically. Patients do not die in this stage, and to produce the duplication of this condition experimentally with any degree of satisfaction is very difficult. We content ourselves by employing the loose but descriptive phrase, "shaking up of the brain." If we are willing to admit that concussion is a commotion of the brain, then the experimental findings of Sven Ingvar[5] of Sweden may aid us in better comprehending what very likely happens in these brains. This author centrifuged the heads of mice at a speed of 3000 revolutions per minute and he was able to demonstrate some surprising results. The conclusions of his histological studies were as follows:

"That the nucleolus of the ganglion cell is the part of the cell most easily moved within that cell and that it is always thrown to the distal end of the nucleus which proves that the nucleus is a vesicle, the contents of which have a low viscosity."

"That the next most conspicuous change after centrifugation consists in an accumulation of the chromatophil substances at the distal end of the cell, and proves that these bodies must exist in a fluid condition in the living cell."

"That the canalicular apparatus is squeezed out of its position in the cell by centrifugation, but maintains its normal morphological character; this demonstrates that the contents of this apparatus do not mix with the chromatophil substances and that they probably have a high viscosity."

"The whole set of neurofibrils loosens as a unit from the cell membrane and when centrifugation has been sufficiently strong, occupies the centre of the cell and encloses the nucleus."

In view of the findings of Ingvar, I am inclined to feel that concussion, although not a demonstrable pathological entity in the human, produces intracellular changes of some degree which is sufficient to cause usually a temporary alteration of some form in the life mechanism of the nerve cell, although permanent sequelæ have been known to follow spinal cord concussion.[6] This explanation perhaps would account for the hitherto unexplainable signs and symptoms in some patients. An illustration of what is implied can be found in this case.

R. M. (N. Y. P. H. 2094), a negro, thirty-one years of age, was admitted to the hospital, September 28, 1923 at 10:30 A.M. He was brought to the hospital in a taxicab after having been struck on the right frontoparietal region with an iron cover of a waste press machine that weighed between forty and fifty pounds. He was unconscious for about five minutes. There was no bleeding from the nose, ears or throat. He was still dizzy upon his admission although he could walk. Vomiting, convulsions or muscular twitchings were absent. His pulse was 60 and the temperature 97.2° F. by mouth. A soft fluctuant mass was present over the right frontoparietal region, the site of the injury. He was put to bed and treated for shock.

The examination was done at 8:15 P.M. that evening. The patient was lying comfortably in bed, not in shock but in very good condition. Evidences of contusions and

lacerations were everywhere absent. No ecchymosis was noted in the mastoid, supra-orbital or external angular process sites. No fractures were palpable anywhere. The swelling over the right frontoparietal region present on admission was absent at this examination; the scalp over that site was freely movable.

The left biceps and patella reflexes were slightly more active than the right ones, the latter being normal in response. The triceps and achilles reflexes were equal and active on both sides. The left epigastric and abdominal reflexes were less active than the corresponding right ones, although the left ones were not diminished. The cremasterics were normal. Ankle clonus, Babinski, Chaddock, Oppenheim, Gordon and Schaeffer were absent. The optic discs were in the main negative, although the nasal margin of the right disc was not as distinct as its corresponding fellow. Blurring of the disc margins were absent. The fundal veins were somewhat enlarged out of proportion to the size of the arteries on both sides. The right pupil was dilated to about 4 mm., the left to about 2½ mm. Reaction to light, in accommodation and consensual reflexes were all normal. Extraocular movements were normal. Nystagmus was absent. The motor and sensory trigeminal distributions together with the corneal reflexes were also normal. The facials were intact. The Rinné and Weber tests were normal, hearing intact, the drums negative but the external auditory canals were full of cerumen. The palate moved normally, the uvula also and the pharyngeal reflex was active. The tongue protruded in the centre, tremor was absent and movements normal. The sensory examination of pain, touch and muscle tendon sense was normal. On the following day the lumbar puncture was performed and the fluid was clear under a pressure of 6 mm. Hg., indicating the absence of increased intracranial pressure. The blood pressure varied from 104 to 122 systolic, while the diastolic remained at 40. The pulse ranged during the first six days between 48 and 60. Most of the time the pulse was between 50 and 60. Between the seventh and the tenth days the pulse was between 60 and 72, being 72 only on the last day of his hospital confinement and the day upon which he demanded his release. The temperature most of the time was subnormal and the respirations remained at the level of 20 during the entire hospital period. The X-ray was negative for fracture and the spinal fluid Wassermann was negative.

Here is a case of cerebral concussion with a pulse between 48 and 60 most of the time, together with subnormal temperature during that entire period and the patient not in shock. These findings do not coincide with any phase of intracranial compression, yet the pulse remained low. The patient may normally have had a bradycardia, but the fact that his pulse did return to a more normal level during the second week would tend to rule out such a possibility. Some alteration in the cell must have occurred to give that clinical picture. The explanation perhaps lies in the anatomical or biochemical change in the cell structure, a change which is sufficient to account for the temporary existence of symptoms and signs and yet of such a character as not to be severe enough to produce the death of individual. Ingvar's theory is plausible and may be the pathological solution of the concussion problem.

The treatment of concussion of the brain is entirely expectant with the patient in bed. The symptoms of headache, dizziness, insomnia, weakness, the various phobias, loss of self control and lack of ambition persist from six weeks to three months. Psychotherapy together with mild sedatives will usually return the individual to normal health provided the legal element is satisfactorily adjusted or permanently eradicated.

Cerebral Œdema.—Acute traumatic cerebral œdema in all probability is the effect of a sudden mechanical irritation of the choroid plexus [7] with a

resultant hypersecretion of the cerebrospinal fluid in the presence of diminished absorption as a result of cerebral venous congestion. In the presence of a linear fracture of the vault or the base where an escape of the excess fluid is afforded, the cerebral compression may either be entirely offset by nature's method of self decompression or delayed by those same means. If the cerebral œdema continues to manifest itself clinically, and I include the accurate estimation of the intracranial pressure by means of the spinal mercurial manometer [8] as one of the clinical signs at our command at the present time, one or more of the several methods of dealing with this condition may be instituted.

Since Weed and McKibben [9] have reported their observations upon hypertonic salt solutions, the neurosurgeon has often had satisfactory recourse to the method described in their enlightening work. Yet, do not be misled into believing that hypertonic solutions are a panacea for all such cases, and that the results are 100 per cent. perfect or permanent. It is a valuable addition to our armamentarium, yet not the final answer to all our traumatic head problems. Salt has proved its value not only in a certain group of acute traumatic craniocerebral injury cases but also in dehydrating tumor brains [10] preparative to and during cranial operations and in that respect making it possible to open the dura safely without risking the complication of forcing the brain out out through the flap window and also assuring the surgeon of safely approximating the bone flap without forcing or jamming the brain back into the skull.

In the milder types of cerebral œdema various dehydrating agents may be used either by intravenous instillation or by high rectal enema. The more common drugs in use for this purpose have their own advocates. There is an element of risk in the use of some of them, although small, yet sufficient to warrant us to be cognizant of that fact; and the possibility of its undesirable effect in certain cases would perhaps lead us to employ other measures which under ordinary circumstances we would not.

Sodium chloride in 15 to 30 per cent. solution, given in 50 to 100 c.c. doses intravenously, is a most powerful dehydrant at our command. Given into the alimentary canal, it has been found to be less potent, but it was observed that the circulatory and respiratory disturbances noted frequently in the intravenous administration were avoided.[11, 12] There are several contraindications to the use of this salt. Chronic cardiac, respiratory and renal conditions immediately bar its use. In addition, it is toxic [13] and dialyzable [14] and as such is capable of becoming absorbed into the cell and forming an integral part of the structure. Once sodium chloride becomes an inherent part of the cellular protoplasm, the biochemical change is permanent and secondary intracellular brain œdema which follows is also permanent and non-reducible.

Personally, I rarely use intravenous hypertonic sodium chloride except when in a particular emergent predicament, as will be shortly narrated in an illustrative case, and then never repeat it because of the danger of secondary intracellular cerebral œdema.

D. A., N. Y. P. H. 6697, was admitted August 22, 1924 and discharged September 5, 1924. The patient was admitted with a pulse of 80 and a temperature of 96.4° F. He was pale, the skin was cold and clammy, perspiring freely and in evident shock. This man, twenty years of age, was struck on the head with a blunt instrument while walking down the main thoroughfare in New York City. He fell to the street and was unconscious for a short time and soon began to bleed from the nose. He also coughed up some blood as well as vomited several times. Mentally he was groggy and disoriented. He was treated for shock.

On the following morning the neurological examination revealed these findings. Both biceps and the right triceps reflexes were unelicited; the left triceps barely responded. The patellas and achilles reflexes were equally depressed. Babinski, Gordon, Chaddock and Schaeffer were absent on both sides, a spurious Oppenheim was occasionally present on the left side. The epigastric and abdominal reflexes were likewise absent. The cremasterics were active on both sides. Sensation to pain and touch were normal. The nasal margin of the left optic disc was slightly blurred; the right disc was negative. The fundal veins were somewhat engorged in both eyes. The pupils were equal in size in mid-dilatation, reacted to light and in accommodation, nystagmus was absent, extraocular movements were normal. There was a right lower facial weakness. The corneal reflexes were active and the sensory portion of the trigeminal nerve intact. The motor divisions, although intact, caused pain when he brought his jaws firmly together. The uvula pointed slightly to the left but moved normally on phonation. The pharyngeal reflex was absent. The tongue deviated slightly to the left; the movements were slow. The mastoid or external angular process did not disclose any ecchymotic discolorations. There were no evidences of active bleeding from the external orifices with the exception of occasional bloody expectoration. His head and jaws were tender wherever palpated, particularly the left temporoparietal part of the skull. A laceration of the scalp over the occipital area was present. The intradural pressure was 14 mm. Hb. and the fluid was bloody; 25 c.c. were removed and the pressure dropped to 4 mm. Hg.

He was treated by repeated lumbar punctures daily with the reduction of the intracranial pressure to normal each day. The intrathecal pressure ranged as high as 24 mm. Hg. and 30 c.c. was the most withdrawn at any one sitting. In addition, he was placed on two ounces of concentrated magnesium sulphate by mouth a day, and the fluid intake was restricted to 1000 c.c. per twenty-four hours. On the sixth day the pulse dropped to 60 and the temperature began to rise to 104° F., the blood pressure was 150/40 and the intraspinal pressure 24 mm. Hg. The cerebrospinal fluid was clearing as far as the hemorrhage was concerned but the reduction in the cerebral œdema was not progressing favorably. The patient was becoming noisy and was definitely more drowsy. The pulse also started to rise during the past hour and had reached 88 per minute. It was felt that a subtemporal decompression should have been performed earlier and that the patient had broken through his compensation and was progressing towards medullary œdema. It was decided to attempt to head off this complication by a subtemporal decompression when it was learned that operative permission had not been signed. All endeavors to communicate with his relatives during the evening proved futile and under those circumstances operation had to be postponed. It was felt then that an intravenous injection of 15 per cent. solution of sodium chloride would tide the condition over until the next morning when permission for operation could be obtained. By the following morning the intradural pressure was reduced to 18 mm. Hg., the blood pressure dropped to 124/44, the temperature was 101.2° F., and the pulse 68. The examination of the urine for evidences of acidosis were all negative. The blood examination on this day revealed 5,360,000 red blood cells, 12,000 white blood cells, hæmoglobin 88 (Dare), color index .8+, differential count, polymorphonuclears 77 per cent., lymphocytes 23 per cent. The water intake was increased to 1200 c.c. a day, a large part of which consisted of orange juice. Magnesium sulphate was reduced to one ounce a day while the lumbar drainage was increased to two taps daily. The temperature gradually approached normal,

the pulse ranged between 60 and 70, the respirations to 20 and the spinal pressure at the end of the twelfth day was 10 mm. Hg. The patient was discharged two days later without any complaints. He had been out of bed for three days previous to his discharge and all dehydration treatment and spinal drainage had also been discontinued at that same time; his fluids were unrestricted from that date. The X-rays never demonstrated any signs of fracture and the spinal Wassermanns were negative on two occasions.

Here is an example of what hypertonic salt solution will do in an emergency, although now I do not feel that the patient was developing a medullary œdema. The similarity of the clinical picture that I depicted to acidosis is very suspicious in spite of the negative urinary findings. I am inclined to believe that acidosis must exist for quite some time before the urine will disclose acetone and diacetic acid. We did fail to do an examination of the carbon dioxide combining power of the blood. That would have solved the question of acidosis. I have always felt the rise in temperature and the rising pulse in this case was due to a beginning acidosis. The power of hypertonic salt intravenously as a dehydrant was very well demonstrated.

Magnesium sulphate is perhaps the best of all the dehydrating agents, in that it is absolutely free from all possible dangers. It is non-dialyzable [14] and, therefore, non-absorbable, and when given either by mouth or by rectum will be productive of results. It is best employed in the form of rectal enema every four hours. The formula I employ is 1½ ounces of the pure crystals of magnesium sulphate dissolved in four ounces of water and administered by high rectal enema every four hours. The fluid is allowed to flow slowly into the gut so that it will be retained for some time. Where expulsion of the salt occurs in an irritable bowel, it must be given by mouth. In many mild cases of cerebral œdema, this therapy will produce the much desired effect. Dowman [15] has reported good results from its use and is very enthusiastic.

Another intravenous agent at our disposal and one that is rapidly gaining more favor than sodium chloride for intravenous use is glucose solution in 50 to 100 per cent. strength. This can be administered rapidly in 100 per cent. concentration without any ill effects.[16] The pressure begins to fall three minutes after the completion of the administration of the drug, and continues for 30 or 40 minutes when it reaches its lowest point and remains there for two hours.[16]

Where dehydrating fluids fail to show a gradual and persistent lowering in the cerebrospinal fluid pressure and the signs of cerebral compression progressively grow worse, repeated lumbar punctures with drainage can be instituted in addition. Sachs [17] vigorously opposes the use of spinal punctures in these cases because of its danger, and states that men conceal their fatalities from this procedure. I have had a death following lumbar puncture in a case of delirium tremens with alcoholic peripheral neuritis. I have also seen many deaths following subtemporal decompression for advanced cerebral œdema in the presence of hemorrhage. Does that therefore militate against or condemn the procedure? Should an occasional death deter us from repeating a measure that has been efficient and beneficial in very many instances? [2] If that were the state of affairs in surgery, then operations for brain tumor

should be contraindicated because of the relatively high mortality. If surgery is to be condemned for an occasional death, there would not be any further need for any kind of surgery.

To obviate some possible deaths or to perhaps reduce the mortality that occurs from lumbar puncture, the patient can be placed in the Trendelenburg position as I have suggested elsewhere [18] for another situation.

If the cerebral œdema shows no indication of being checked by the above-mentioned measures within four or five days, it is better judgment to perform a subtemporal decompression with cranial drainage in order to give the individual the best possible opportunity for the restoration of normal physical and cerebral functions.

In cases of fractures of the base of the skull in the posterior fossa, the œdema, if present, is very apt to be not only progressive but drastic in its effects upon the medulla. Where cerebellar signs are present with medullary compression the suboccipital decompression must be performed in preference to the subtemporal decompression. When the stage of medullary œdema has already been reached, there is very little available in the line of therapy to overcome that handicap. Rand and Nielsen[19] have performed cisterna magna punctures in two moribund cases without any success. On theoretical grounds, I feel that the too sudden escape or the too great removal of the amount of fluid from the cisterna cerebellomedullaris can be safely avoided and combated as well as better gaged if the patient should be placed in the Trendelenburg position during the entire procedure and to be allowed to remain so for several hours after. Should this technic prove favorable, it will grant the injured just one more chance to adjust his medullary compensatory mechanism and put him in better position for operation. Where medullary œdema persists in spite of all treatments, operation is absolutely contraindicated.

Cerebral Œdema with Intracranial Hemorrhage.—The association of intracranial hemorrhage of fair size with cerebral œdema presents to us a problem which must be diligently handled in order that a chronic condition may not persist as a result of dilatory measures.

Repeated lumbar punctures with drainage have proved their merit as a means of draining subdural hemorrhages. Repeated spinal drainage has also proved efficacious in relieving mild degrees of cerebral œdema. Where the combined condition exists, repeated spinal punctures should be given a trial for a few days. Dehydrating fluids should not be employed here for fear of concentrating the extravasation by the removal of the fluid portion of the blood and thereby facilitate the formation of a blood clot, the absorption of which will leave behind an organized fibrous residue coating the supracortical veins which situation tends to create a chronic wet brain, which corresponds to the hydrocephalus non-absorptus,[20] by interfering with the natural process of excretion of the cerebrospinal fluid. When lumbar drainage fails to satisfactorily relieve both conditions, subtemporal decompression with cranial drainage is the procedure of choice. The following case is extremely interesting in that the treatment advised above in cases of combined hemorrhage with

cerebral œdema resulted from being able to see the patient's brain at operation after two weeks' trial with dehydrating fluids and repeated lumbar punctures. This is an instance where I endeavored to be conservative and attempted to institute non-operative measures to restore this patient to well being but after dehydrating him for two weeks and performing twenty-two lumbar punctures within that time, I found that his mental condition was such as to require operation. His cerebral œdema persisted in spite of all non-operative measures. I then operated and the patient immediately reacted to the cranial drainage and has so improved that it is almost impossible to retain him in the hospital; he wants to go home.

J. G., a laborer, fell from a scaffold, a distance of 30 or 40 feet. He was found unconscious and was admitted to the hospital on February 19, 1926 (N. Y. P. H. 15,691). On admission his temperature was 97.4° F. (axillary temperature), pulse 80, respirations 25. He was treated for shock. (Admission 11 A.M.)

At 4 P.M. I examined him and these were the findings then. Our patient was a strong, well built man, lying in bed, somewhat restless and fairly coöperative. There was a scalp wound about two inches long in the left posterior parietal region, overlying the midline. There was slight bleeding from the scalp wound on pressure and the collection of blood in the tissues was insufficient to be called a hæmatoma. It was difficult to see the fundus of the left eye as the patient did not hold the eye fixed long enough for the disc to be located. The right eye was artificial but a perfect duplication of the other. The left pupil reacted to light, nystagmus was absent, all extraocular movements were normal. Ptosis of the lids was not present. Ocular movements of the glass eye were very good, no palsies were noted. The left pupil was about 3 mm. in size. A slight left lower facial paresis was present. Bleeding from the ears, nose or throat was absent. Ecchymosis under the left eye was beginning to accumulate. The tongue was cyanotic and was not protruded very far out of the mouth. The biceps and triceps were equal and normal in response. The patellas were unelicited; the achilles both active, the right one a little more so than the left. Definite right-sided Babinski was present without any of the modifications. The left presented fanning though no absolute Babinski. The sensory examination was not reliable. The cremasteric reflexes were normally present but the abdominals and epigastrics were absent. The lumbar puncture revealed bloody cerebrospinal fluid, the color of port wine, under a pressure of 20 mm. Hg. After the removal of 46 c.c. of this fluid the pressure dropped to 9 mm. Hg. I decided to attempt to try conservative non-operative treatment upon this case The results proved to be more than interesting, they were very instructive.

For two weeks this man was dehydrated with concentrated magnesium sulphate every four hours per rectum together with two spinal drainage taps daily. The pressure was reduced each time to normal. At the end of two weeks of this careful observatory treatment the intracranial pressure still remained unreduced, the patient was noisy, irrational and at time mentally retarded and dull, his pulse 60 with a poor prognosis for future normality if his condition was not relieved. Subtemporal decompression was decided upon and on March 6, 1926 I operated. The permanent cranial opening made was fully 2 x 2½ inches in diameter. On the second day post-operative he began to show signs of mental improvement which has progressively continued up to the present and the patient is now ready for discharge. One word in reference to the operative findings. When the brain was exposed it was found to be pale yellow, very wet and œdematous, and the supracortical veins and cerebral sulci were covered by white organized tissue that is found after the absorption of a hemorrhage in this site. (This case will be reported in detail in a future publication). The operative area is at present slightly depressed and pulsating normally indicating the absence of an increased intracranial pressure and a return to normal intracranial conditions.

Intracranial Hemorrhage.—Hemorrhages in this locality are either extradural, subdural or intracerebral. When it is felt that the middle meningeal artery has been lacerated and continues to bleed, operation is absolutely compulsory to control this hemorrhage whether increased intracranial pressure exists or not. Cases of extradural hemorrhage also require operation as spinal drainage by means of repeated lumbar puncture will not influence the extravasation in this site. Subdural hemorrhages of mild degree lend themselves favorably for spinal drainage by means of repeated lumbar punctures every six to twenty-four hours, depending upon the severity of the hemorrhage. Where the bleeding is not progressive and cerebral compression does not supervene, repeated lumbar puncture drainage gives satisfactory results. If, on the other hand, the hemorrhage is progressive or if the percentage composition of the blood in the cerebrospinal fluid does not indicate a daily decrease by means of repeated lumbar punctures, cranial exploration with drainage is essential in order to avoid the effects of chronic subdural hæmatomas.[21] Intracerebral hemorrhages in themselves require no special attention; the destruction of cerebral tissue has already occurred and the damage is irreparable and permanent. So-called idiopathic epilepsy of the adult very often is the end result of a long forgotten or undiagnosed intracranial, more often petechial intracerebral, hemorrhage.

Cerebral Contusion and Laceration.—Contusions of the brain unassociated with any complications require no special treatment in themselves. Where laceration of brain tissue has occurred, there is very apt to be varying amounts of hemorrhagic clots in the site of the cerebral destruction. Operation in these cases is performed only with the intention of cleansing the field and draining whatever œdema or oozing that may occur. The latter type of case is usually associated with intracranial hemorrhage either intracerebral or subdural. The repair of the damaged brain must be left solely to nature. The resultant scar formed in the process of healing may be the cause of future epilepsy, and that is not within the scope of our power to prevent.

SUMMARY

Whether a fracture, aside from depressed fracture, is present or not is not of material consideration in the treatment of cerebral œdema with or without intracranial hemorrhage or any other cerebral lesion. The presence of a linear fracture, as has often been pointed out, is of great benefit to the individual suffering from a severe head injury. It is a natural method of decompression and endeavors to prevent the development of cerebral compression.

The relative value of the dehydrating agents must now be given some attention. Sodium chloride in 15 to 30 per cent. solution intravenously with its attendant cardiac, respiratory, renal and dialyzable dangers can be relegated to the realm of drugs which have already served their purpose in the progress of scientific advance. It need never be employed in view of the other safer measures at hand.

Glucose in 50 to 100 per cent. solution given intravenously in quantities

up to 100 c.c. within a few minutes has not caused any ill effects in the hands of its experimenter.[16] It does not produce any of the disturbances that renders sodium chloride undesirable, yet it possesses the same fault that any intravenous solution has, in that it creates an initial rise in the intracranial pressure before lowering it. It must, therefore, be used cautiously in those cases of medullary compression where the margin of safety is comparatively small in view of further increase in the intracranial pressure. It is better surgical judgment, in my opinion, to operate upon these cases in this stage than to attempt to dehydrate them, for the additional rise produced by the intravenous solution may cause a medullary œdema if the compression is progressive. Surgical interference at this time is absolutely contraindicated. Glucose should be used in cases of cerebral œdema in preference to the other intravenous solutions if that route of treatment is desired. One must be certain that pancreatic diabetes is not present in the individual who is to receive the solution, as diabetic coma may develop from such an additional amount of sugar given into the blood stream.

Magnesium sulphate in the concentrated solution advocated is the ideal of all the dehydrating fluids at our command. It can be administered either by rectum or by mouth with perfect safety and freedom from any of the above mentioned dangers. Besides, it does not have the disadvantageous feature of producing the initial rise in the intracranial pressure that all the intravenous solutions possess. It is the ideal of all the dehydrating agents and is one of choice. Downman [22] even employs it intravenously in 10 per cent. sterile solution, giving 10 c.c. in the adult every four hours for six to eight doses, and claiming very laudable results. He has not met with any toxic or untoward effects. I have no personal experience with this method. Naffziger [23] has described a condition in which the collection of fluids was found to be subdural; these cases respond well to salt dehydration or to operation. There is no way at present to diagnose this condition prior to operation.

In cases of non-progressive hemorrhage associated with or without linear fractures of the vault or base of the skull, lumbar punctures with drainage should be given a trial for a few days if the condition of the patient does not warrant an immediate operation. If the quantitative percentage of the blood in the cerebrospinal fluid does not diminish at the end of four or five days of repeated lumbar drainage, subtemporal decompression should be performed for the purpose of restoring a normal individual without future emotional instability. In cerebral œdema either with or without hemorrhage, lumbar puncture may also be used with the same indications as described for hemorrhage. In uncomplicated cerebral œdema lumbar puncture may be added to the dehydrating salts to facilitate and hasten the reduction in the increased intracranial pressure.

The subtemporal decompression still retains its undisputed value as a means of not only saving life and reducing cerebral œdema but also of restoring the injured to future normality. The operation is indicated where the salt dehydration and spinal drainage fail to produce the desired results and in

cases of progressive hemorrhage due either to the rupture of cortical vessels or the middle meningeal artery, or in cases of extradural hemorrhage and subdural hæmatoma. A bilateral subtemporal decompression must be performed in those cases where the brain fails to pulsate after one side has been operated upon and where the brain still continues to bulge in spite of the relief of pressure on one side.

Suboccipital decompressions are indicated particularly in those instances where fractures of the posterior fossa exist with rapid forming medullary compression associated with cerebellar signs. Where other non-operative procedures fail, decompression is indicated. There are just two contraindications to operation and they are at both extremes, namely, shock and medullary œdema.

A helpful rule to bear in mind, when in doubt as to the proper procedure to employ with the patient out of shock and not in medullery œdema, is to perform a subtemporal decompression for the future welfare of the patient. What may seem to be radical advice is in competent hands a measure far less dangerous to the future well being of the patient than dilatory procedures which may render him unstable and emotionally unqualified to combat the daily struggles of everyday life.

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ASYMMETRY OF THE MANDIBLE FROM UNILATERAL HYPERTROPHY*

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The following case of unilateral hypertrophy of the mandible merits recording on account of the rarity of the condition and of certain circumstances connected with the diagnosis.

F. B., a mechanic, aged twenty-four. No congenital deformities in his family. At the age of ten years he suffered from an inflammatory process of his right ear, accompanied by pain and discharge from the ear. The latter stopped after a year, but there remained a partial impairment of hearing. When he was thirteen years old his family became aware of the fact that his under lip and chin deviated slightly to the left and his teeth did not exactly correspond. He then underwent an orthodontic treatment by a dentist, who tried to enlarge correspondingly his upper alveolar process(?). The treatment, which continued till 1918, was, however, unsuccessful, as the deformity grew gradually worse. With its progress, pain, spontaneous and on movement appeared in the region of the right temporo-mandibular joint, radiating along the right half of the mandible. From time to time opening the mouth or closing it after yawning became impossible. Within the last ten years many examinations by internal specialists, dentists, neurologists and surgeons were made. As his hands and feet were found somewhat too large, acromegaly was suggested. The organotherapeutic treatment with hypophysis and thyroid gland extracts has, however, had no influence on the course of the deformation. The last examination in the neurologic clinic of the J. C. University a week prior to his admission to our clinic was negative. No sella turcica enlargement or destruction was then found

Fig. 1.—Case I, before operation.

* Read before the Medical Association in Lwów, January 29, 1926.

in the X-ray picture. Eye ground was also normal. Examination of the ears revealed destruction of right drum and a chronic middle ear inflammation of the left. Wassermann test in blood and cerebrospinal fluid negative. In urine no pathological contents. On admission to the clinic the patient asked for operation because of pain and disability as well as because of the facial deformity, which hindered him from getting any employment. He said he had decided to commit suicide, if his state could not be improved.

Examination on Admission April 21, 1925.—A strong, well-developed, not very well-nourished man. The face showed on inspection a deformation of very high degree (Figs. 1, 7). The chin was drawn considerably toward the left side and forward. The lips, the under lip especially, displaced also leftward. The left half of the under lip forced nearly one and a half cm. in front of the upper lip. The left naso-labial sulcus, running more horizontally than the right, was flatter. The right cheek fuller and more rounded. The middle line of the mandible drawn about two and a half cm. to the left, the most eminent point of its curvature being about 3 cm. in front of that of the maxilla. Also the lower border of the mandible considerably lowered. When the mouth was closed the upper right canine corresponded to the first right lower molar. The incisors were about one and a half cm. in front of the upper incisors. The shape of both alveolar arches approximately equal. The range of movement of the mandible normal. By movement to the side a noise in the right temporo-mandibular joint was audible to the observer. The deformation was less apparent when the mouth was open, but on closing, the middle of the mandible ran an arch to the left.

FIG. 2.—Case I. Postero-anterior X-ray picture before operation. Right half of the mandible considerably hypertrophied and asymmetric. Slight asymmetry of right maxilla.

By palpation one found the external surface of the right half of the mandible more rounded outward and downward. The ascending ramus longer, the region of right temporo-mandibular joint somewhat tender on pressure, the coronoid process lowered, the mandibular incisura deeper, than normal and easily touchable from the inside of the mouth. The right half of the mandible was about 3 cm. longer and ¾ cm. wider than the left.

The internal and external soft parts of the face normal and symmetrical. The nose was normal. There was no obstruction or enlargement of the sinus. Also no overgrowth or thickening of the skin or subcutaneous tissues of any part of the body. The nervous system showed no signs of abnormity. Circulatory, respiratory and abdominal organs normal. Feet and hands seemed to be in relation to the stature somewhat too large but otherwise normal.

The Röntgen-ray examination (Figs. 2, 2a and 3) showed the skull large and long. Its vault thickened in the region of the tubera frontalia. The coronaria sutures indistinct, the occipital distinctly visible. The grooves for the meningeal vessels faint, of normal breadth. The bottom of the anterior cranial fossa slant. Cerebral juga here somewhat increased. The middle cranial fossa regularly vaulted. The sella turcica spacious, thimble-shaped, of normal depth. The contours of its bottom smooth and regular. The anterior and posterior clinoid process well developed, smooth, regularly outlined. The posterior fossa somewhat backward vaulted. The face skeleton asymmetrical. The chin drawn to the left. Right half of the mandible considerably enlarged in all directions and curved outward and downward, the middle of the horizontal ramus being displaced about 3 cm. to the left and by one and a half cm. forward in comparison with the maxilla. Its external and lower borders curved and lowered, forming an uneven arch from the lower right to upper left. Also the medial part of the left half of the mandible to the left canine was hypertrophied. The rest of it was in comparison with the opposite side flattened, smaller and narrower, but apparently normal. Its interior structure was also normal, whereas the right part showed changes in the structure, its spongy bone tissue being of regular network, but with unusually enlarged holes. The canalis of the mandible was distinctly visible, not narrowed. Round the roots of the premolars and molars granulations focis were visible.

FIG. 2a.—Case I. Outline sketch from Fig. 2, inverted.

The main changes were found in the right ascending ramus and especially in the condyloid process, the articular head of which, being considerably enlarged and club-shaped, was composed of two unequal parts, separated by a shallow groove. Below the capitulum there was a conic bony process, separated from it by a deep cleft, about one and a half cm. long, inclined to the under surface of the zygoma.

The condyloid process well developed, thickened, almost twice as thick and one and a half times as long as that of the opposite side, curved its whole length. Its thicker cortex surrounded dense spongy bone tissue. The coronoid process appeared also hypertrophic, massive. The lingula thorn-shaped. The rest of the vertical ramus also by a finger-breadth longer than that of the left side and bent outward. Right upper alveolar process slightly hypertrophic, inclined downward and bent to the left. Its interior structure normal. The sinus well developed, distinctly margined and of normal air contents. *A diagnosis of overgrowth of the right head and neck of the mandible was made.*

Operation May 7, 1925, by Professor Schramm. Under local novocaine anæsthesia of the third branch of the right trigeminus nerve and imbibition of soft parts round the temporo-mandibular joint, an incision was made along the lower border of the zygoma; two cm. in length backward to the auricle, thence downward for two cm. in front of the last. The joint was exposed and opened and then the periosteum removed from

the whole circumference of the neck of the condyloid process. To protect the soft parts two elevators were inserted behind the bone and then the neck was cut with chisel and hammer from behind and below forward and upward, thus shaping the stump like a normal head. The head was then grasped firmly with a forceps, turned and pulled out from the joint cavity. The intra-articular disk was left in place. The mandible was then righted without difficulty of any kind. The wound was closed in layers and a plaster bandage applied holding the jaw in its new position.

May 8.—Right angle of the mouth lowered. Impossible to close right eye.

May 17.—Wound healed by primary intention. The patient could open and close his mouth without discomfort to a normal degree. The paresis of the lower branch of the facial nerve improved. Though the middle of the mandible was now exactly in the median line, the face was somewhat asymmetric, for half (the right side) of the jaw remained from ½ to ¾ cm. too low. The incisors of the jaws were also still not in contact for the lower molars were too long. The patient was given over to the stomatologist (Professor Doctor Cieszynski), who extracted the fifth and sixth upper and filled the lower, thus restoring the normal articulation.

FIG. 3.—Profile photograph of the affected side in Case I. Considerable prognatism. Enlarged and deformed right capitulum of the mandible. Sella turcica normal.

July 20.—The facial nerve paresis was gone: with some effort the patient was able to raise right angle of the mouth and close right eye. The scar of the operation scarcely visible on inspection. Right upper canine corresponded to the lower one, but the latter as well as the lower incisors were still slightly in front of the upper. The molars were in good opposition.

The removed piece of the condyloid process was like an inverted pyramid, flattened in antero-posterior direction 4.9 cm. in length, 3.3 cm. in width in its upper, 1.4 cm. in its lower extremity. The articular surface enlarged in all directions and uneven showed a sulcus running in sagittal plane, dividing the articular surface in two unequal parts, both covered with cartilage smooth and shiny. There were some exostosis at the margins of the cartilage, forming a sort of a collar round the articular surface. On the anterior aspect of the mass the cutting surface was visible, reaching the middle of its length. Thus the operation resulted in the shortening of the ascending branch of the mandible by about two and a half cm. (Fig. 4).

A Röntgen-ray photograph of the removed bone revealed that the inner part of the mass was composed of two exostoses, one at the head, the other at the neck of the condyloid process, separated from each other by a deep cleft. The bone tissue appeared normal without any structural change.

The microscopical examination of a section taken from the articular end of the mass showed spongy bone normal in structure. Bony cells of typical arrangement. Bone-marrow composed of fat tissue poor in cells. The articular cartilage, hyaline, showed cells in proliferation. The latter arranged in columns parallel to the axis of the bone.

In the bone tissue just beneath the cartilage numerous vascular buds and tufts perforating the subcartilaginous tissues and entering the cartilage: all signs of advancing ossification within the epiphysis. Periosteum of the neck normal without distinct traces of hyperproduction of osteoblasts or irritation. There were in the whole section no traces of inflammatory reaction, degeneration or destruction neither of cartilage nor of bone (Figs. 5 and 6).

There was thus in the above case a deformation of the mandible in the form of unilateral prognatism, which progressing slowly, developed within eleven years, the main cause of the deformation being a hypertrophy of the head of the condyloid process of the mandible, in minor degree the overgrowth of the whole half of the jaw itself.

FIG. 4.—Case I. The removed part of the condyloid process of the mandible. The dotted line shows from where the section Figs. 5 and 6 was taken.

There are known but few similar cases. Lohmann (1919) was able to record fourteen in the literature, including one of his own. Though carefully reviewing, we could not find more in the recent literature being at our disposal. The case of Perthes, demonstrated 1922 before the German Surgeons' Association at Tuebingen, though apparently similar, cannot be included here. There was a hypertrophy of the mandible more to one side, but the affection of the head of the mandible was absent.

REVIEW OF REPORTED CASES

CASE I, HEATH.—In the case of a female, aged thirty-six deviation of the chin to one side owing to hypertrophy of the ascending ramus and to an exostosis at the head of the mandible developed during a period of ten years. Twenty-five years ago there was an apoplectic insult, with constant paresis of muscles of the now affected side of face.

CASE II, HEATH.—In a female, aged twenty, hypertrophy of the head of the mandible and malposition of the teeth. After natrium jodatum administration and the application of anti-rheumatic remedies locally and the deformation was supposed to stop growing.

CASE III, quoted by HEATH.—In a female, aged twenty-four, one temporo-mandibular joint was larger than the other.

CASE IV, MCCARTHY.—In a middle-aged male right mandibular epiphysis appeared as a bony mass, inverted pyramid-like. The articular surface smooth and flat seemed to be covered with a fibrous cartilage. At the inner aspect of it there was a deep sulcus noticeable passing into a cleft, directed outward and downward to the external surface of the bone. Both the sulcus and the cleft formed the upper limit of a bony mass, which was suggested to be an enlarged articular head. The affected half of the mandible was in all directions larger, than the other. The horizontal branch was in the region of the angle twice as large as the unaffected side.

CASE V, ADAMS.—In a female, aged thirty-one, deforming arthritic processes of

almost all joints of the body. There was also deformation of the face and marked limitation of movement of the mandible. At an autopsy the articular cartilage was found absent, the neck of the condyloid process markedly lengthened. There was also an exostosis at the last and widening of the glenoid cavity.

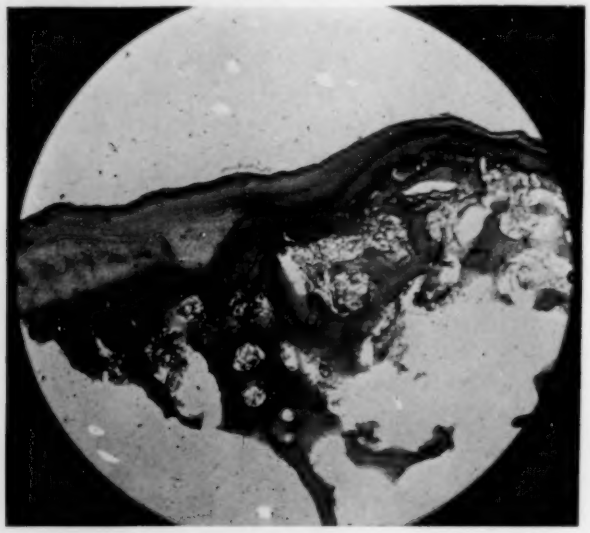

FIG. 5.—Case I. Microphotograph of a section from the articular end of the removed bone. a. Perichondrium. b. Periosteum. c. Bone marrow. d. Columns of cartilage cells. e. Vascular buds. (Zeiss, Microtar, oc. 2. Photograph furnished by Doctor Hilarowicz.)

CASE VI, EISELSBERG.—A man aged forty-two, developed within three years the typical deformation of the mandible, the articular head being of pigeons egg size, the articular surface thickly granulated.

CASE VII, EISELSBERG.—In a male, aged twenty-one, crackling and pain in a temporo-mandibular joint, dating back for half a year. The articular head proved to be enlarged and the articular surface rough and uneven.

CASES VIII to X, VOELKER.—The ascending ramus of the mandible was lengthened by 3–5 cm., the head of it deformed and enlarged reached the size of a nut.

CASE XI, RIEDEL.—In an elderly man symptoms of neuralgia of the fifth nerve, resistant to any treatment and typical deformation of the face. After resection of the head of the mandible, the symptoms disappeared at once. After a time the other temporo-mandibular joint became affected. The patient was also suffering from deforming arthritis in many joints.

FIG. 6.—Case I. Microphotograph of the same section as in Fig. 12. High power. a. Perichondrium. c. Bone marrow. d. Columns of cartilage cells. e. Vascular buds. (Zeiss, obj. A, oc. 2. Photograph furnished by Doctor Hilarowicz.)

CASE XII, GRUBE.—In a female, aged seventeen, typical deformation of the face with malposition of the teeth in subsequence of an exostosis at the articular surface, covered with cartilage, unchanged in appearance. The neck of the condyloid process was normal.

CASE XIII, ECKERT and MIKULICZ.—A female aged fifty, developed during a period of nine years typical deformity combined with pain and noise in the joint when moved. An operation disclosed an osteoma, size of a plum, at the medial aspect of the articular head.

CASE XIV, LOHMANN and PERTHES.—In a female, aged twenty-one, typical deformation of the face and teeth, increasing for a period of one-half a year. The articular head proved to be enlarged with flat surface and with an exostosis at its anterior aspect covered by cartilage.

There can be no doubt that our case, though there is a close resemblance only to the case of McCarthy, belongs to the same condition, containing all its main characteristics.

The clinical picture of the disease can therefore on base of the fifteen above named cases be described as follows: There develops in persons young or of middle age, more frequently in females than in males, otherwise normal (with the exception of two cases with deforming arthritis), unnoticeably or with sudden attack of pain, but mostly without any known cause, an unilateral hypertrophy of the head of the mandible or of both the head and neck and, very seldom of one-half of the mandible, followed by typical deformation of the face in the form of unilateral prognatism and malposition of teeth. The period of development lasts from one to over ten years. There is often some pain present and noise on movement in the joint. The articular head may reach the size of a walnut, is irregularly enlarged and flattened, in most instances covered with smooth and even or granular cartilage. There are also in most cases exostoses at the anterior or inner aspect of the head or neck.

It would appear that the diagnosis is not a difficult one. And it is really so to anyone who has had an opportunity of meeting with description of such a case, for otherwise, as mentioned, the condition is very rare. In our case there were many examinations by internal specialists, neurologists, surgeons and dentists and different diseases were diagnosed, as leontiasis ossea, Paget's disease, and most frequently acromegaly. There are several conditions giving to some degree similar symptoms, as congenital hemiatropy (Hemignathia, Mauclaire), acquired hemiatrophy, facial congenital hemihypertrophy, unilateral excessive rounding of one-half of the face (case of Richelot), or of the mandible alone (case of Perthes), deforming joint changes, syphilitic hyperostosis, inflammatory or traumatic destruction of a part of one-half of the mandible, acromegaly, and at last leontiasis ossea in some of its form. The first named diseases may be excluded without difficulty. Leontiasis ossea was suggested by dentists owing to the fact that there was also a hypertrophy of the whole half of the mandible, of right alveolar process and some signs of overgrowth of the frontal tubera. But even leontiasis ossea in any of its forms, even delayed or only local, should be excluded, for there are no structural bone changes, essential in any form of the above disease, no obstruction of the sinuses or bone canals, and with regard to the localization in the mandible, the head of the condyloid process being the most markedly affected part. In an X-ray picture furnished three years ago, there was a very marked hypertrophy of the condyloid process visible, whereas the overgrowth of the horizontal ramus and the upper alveolar process was very slight. We favor therefore the assumption that the primarily affected and the only

seat of the very process is the articular head and neck, or briefly the epiphysis of the condyloid process, the overgrowth of horizontal ramus of the mandible and of the upper alveolar process being due to the want of contact of the teeth in both jaws during the period of growth of the organism. The jaw-bones are very plastic and they react readily with change of shape and size to any injury or to any force acting during this time. As the anatomical findings in all reported cases (15) up to now were identical, we believe we are dealing with a distinct pathological and clinical entity of unknown and, maybe, different etiology, but of typical course and picture.

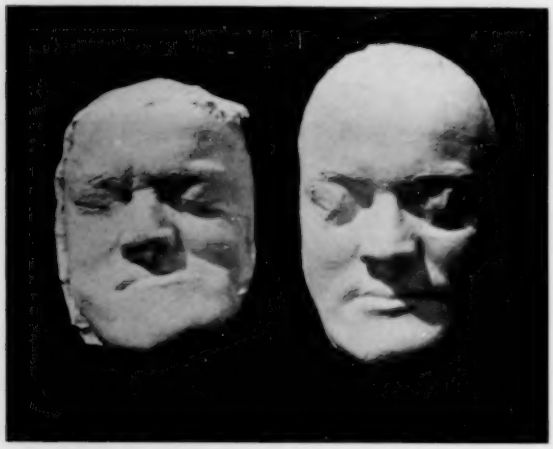

FIG. 7.—Case I. Plaster-of-Paris masks. The left before, the right after operation.

To explain the genesis of the condition some agents have been taken into consideration:

(1) Eiselsberg and Adams assume on the basis of slow progress of the deformity, on the appearance of the articular head showing roughening and destruction of the cartilage, a chronic arthritic process (mono-articular rheumatic form described by Sandifort, Eiselsberg), in spite of uni-articular localization, lack of any trauma in the past history, though no changes were found in the subcartilaginous tissue. An arthritis deformans existed with certainty in the only case of Adams. But even there both conditions, arthritis and hyperostosis, could be independent from each other. It is hardly possible as stated by Heath and others that deforming arthritis could be able to produce lengthening of the neck of the condyloid process. In our case there is no ground for assumption of arthritis deformans, as there are no signs of cartilage destruction. But an influence of the near inflammatory focus in the ear or of some toxins, descending from it, cannot be excluded as a cause exciting the overgrowth. Possibly the inflammatory hyperæmia of long standing may be a factor sufficient to start the overgrowth of the epiphysis.

Another case observed recently seems to corroborate this view:

CASE II.—J. K., female, aged twenty-one, a student. Family and past history unimportant, excepting that for last eight years she was suffering from a chronic right middle ear inflammation, accompanied by pain and discharge from the ear. In the last few weeks there were symptoms of a subacute mastoiditis. Six years ago she noticed slight deviation of the chin to the left and malposition of the teeth. The deformation gradually growing worse. During the last years mastication became impaired.

An examination January 3, 1926. A well-nourished, well-developed girl. The face showed on inspection, that the chin was drawn to the left. Right cheek was fuller

and rounder, left flatter. The middle of the mandible was in comparison with the middle of the maxilla displaced about one cm. to the left. First right upper incisor corresponded to second right lower incisor. The right lower teeth were forced inwardly, while the left ones outwardly from the upper teeth. Mastication was reduced owing to the fact, that the molars met only at their margins. There was also slight prognatism. Otherwise no pain or noise in the joint region.

Other organs with exception of destruction of right tympanum and chronic middle ear inflammation normal.

In Röntgen-ray picture, right articular head and neck of the mandible was found distinctly larger than the left. Also the distance from the zygoma to the angle of the mandible was by some millimetres, longer than to the left. The mandibular angles on both sides somewhat more open than normal, owing to slight prognatism. Otherwise there were no changes in bones of the face, head or others.

The patient was turned over to her ear specialist to be cured of the middle ear inflammation.

FIG. 8.—Case III. Considerable asymmetry.

This case represents the very beginning of the deformation, which suggests some connection with the middle ear inflammation. But why the deformation is so rare, while the middle ear inflammation in young individuals rather common, remains unknown.

(2) Also sensitive or trophic changes were considered, as the main cause of the disease, in accord with the theory of Trèlat-Monod, advanced for the congenital facial hypertrophy and proved experimentally by some authors (Bazelli, Stilling, Lewin, Cl. Bernard, Schiff, Montegazza, quoted by Werner). A sort of hyperfunction of the trophic nerves (Ziehe). In Case I of Heath, the basis of development of the deformation was paresis of the facial muscles after an intracerebral hemorrhage.

(3) The intra-uterine position was supposed by Koelliker and Lohmann: the reduced amount of fluids in the uterus and subsequently excessive unilateral pressure being due to an enlargement of the glenoid cavity, the latter giving then a stimulus to the overgrowth of the head of the condyloid process.

Such supposition or a congenital fault may explain the genesis of the deformation in the third case observed in our Clinic:

CASE III.—J. K., aged forty-nine, a guard in the tramway. Family history unimportant. There were no deformities in his family. The only disease the patient was ever suffering from was small-pox. He was otherwise always well, excepting that he was wounded on the parietal bone in the war (1915). Since he could remember his face was asymmetrical from the earliest youth and his teeth did not exactly correspond. The chin was protruded slightly forward and drawn considerably to the right. He was not able to say with certainty, whether the condition dated from the birth, but he denied to have ever sustained any injury to the face. The state remained unchanged since he became aware of the deformation. The condition never caused any serious discomfort to him; there was neither pain nor noise in the joint. The only inconvenience was impairment in mastication; he often wounded his tongue at taking food. He was not coming in search of help at the Clinic, but he was asked by one of us to call at the Clinic in order to undergo examination.

FIG. 9.—Case III. The ascending ramus considerably longer, the horizontal wider to left than to right.

Examination January 25, 1926.—A strong, well-built man. The face showed on inspection considerable deviation of the chin to the right and slight protrusion forward (Fig. 8). The left cheek was fuller and more rounded, the right concave. The most eminent point of the left side of the face was the zygomatic arch, to the right the region of the mandibular angle. Left border of the mandible stood some centimetres lower than the opposite side. The length of the ascending ramus, measured from the lower edge of the zygoma to the lower border of the angle, was 10 cm. on the left and 7 cm. on the right. The length of the horizontal branch of the mandible equal on both sides eleven and three-quarters cm. The middle of the mandible was drawn about two cm. to the right, but when the mouth was closed, the first left upper incisor corresponded to the first left lower incisor, the latter being by a half of its width forced to the right and in front of the upper. Evidently the maxilla became also pushed somewhat obliquely, its vertical axis being inclined to the right. The left lower teeth were forced inwardly, while the right ones outwardly from the upper teeth, the lower alveolar arch crossing the upper one in the level of the incisors. The molars met only with their margins.

The patient was otherwise completely healthy, with exception of slight deviation of the nose to the right. The nose was not obstructed, the intra-oral organs normal and symmetrical. There was also no overgrowth of the skin of the face nor on any other part of the body. The nervous system showed no abnormity.

In the Röntgen-ray picture (Fig. 9) the left condyloid process was found to be over one-third longer and by one-half thicker than the right, bent backward and club-shaped. The articular head to be one-half as wide in the sagittal plane and one-third longer in the frontal plane than that of the right. The glenoid cavity also correspondingly enlarged. The rest of the ascending ramus larger than that of the unaffected side but not lengthened. The horizontal ramus larger to the left than to right, of equal length. The vertical axis of the maxilla slightly inclined with its lower end rightward,

but otherwise normal. There were in the X-ray picture no structural changes visible in any of the bones.

The patient did not agree to be operated upon, as the deformation was not disturbing him.

If either of the above stated explanations will prove right, there is still a question to be decided.

Pathological Classification.—The question of the pathological classification of the disease is still also an open question.

Many names have been used: new growth-osteoma, inflammatory process, hypertrophy with a character of a benign tumor or exostosis. Lohmann and Perthes, the last to review the subject, called it "tumor-like hyperostosis of the jaw." Our cases merit to be termed overgrowth.

FIG. 10.—Case I. The patient after operation.

Treatment.—To influence the progress of the deformity some ways have been attempted, such as anti-rheumatic treatment (Heath), anti-syphilitic treatment (Mikulicz), or in the above case with some organotherapeutic remedies without any noticeable effect with exception for Case II of Heath. The correction of the deformity itself is possible, of course, only by operative measures. In our Case I with regard to the fact that the whole half of the mandible was enlarged, two methods were considered:

The excision of a part from the continuity of the mandible, unilaterally or bilaterally, a method advised by Blair for the treatment of prognatism and employed in various modifications, or resection of the head of the condyloid process of the affected side, described first by Bottini (1872) and then by Koenig, was advised for prognatism, bony ankylosis, irreponible luxations of the mandible.

The first method is more troublesome to the surgeon because of difficulties of the double cutting of the bone, necessity of applying more or less complicated splints to hold the fragments and more dangerous to the patient on account of the possibility of lesion of the gum and of a pseudo-arthrosis

formation. It necessitates the extraction of healthy teeth and dividing of the nerves and vessels in the canalis of the mandible. It requires also long after-treatment, annoying to the patient because of the impairment of taking food and—the main objection—it leaves the articular head, the very focus of the disease, untreated, thus giving a possibility of an eventual recurrence.

The other method, which has been employed by all who operated for the disease in question (Heath, Eiselsberg, Voelker, Riedel, Mikulicz, Perthes), is a considerably smaller operation, permitting an early movement and use of the mandible. The only objections to this method were the difficulties of approaching to the temporo-mandibular joint itself. There are numerous important structures in close proximity to the field of operation, among which may be mentioned the facial nerve, the internal maxillary, temporal and carotid arteries, the parotid gland and Stenson's duct. Several times there were lesions of the facial nerve reported after operations in this region (Mikulicz, Voelker, Bockenheimer, 20 per cent. of all operated cases) of the parotid gland (Carr), or internal maxillary artery (Carr). In such an instance, as described above, the enlarged capitelum causes considerable displacement of soft structures and one can never be sure enough of avoiding an injury to any of them. The question of skin incision is very important therefore, and it is not surprising that a considerable number of methods of skin incision were recommended. The small curved incision, as advised by Koenig, Lexer, Wrede, Ashhurst, and others, made in the above case, permitted one to avoid a serious lesion of the seventh nerve or of the parotid gland, but the removal of the enlarged head of the mandible was somewhat difficult and probably only to manipulation with it is due the temporary paresis of the nerve. Some writers oppose the use of a chisel and mallet upon the skull, particularly the base of the skull near the mastoid and maxillary articulation, because of possibility of thus producing a fatal shock (Carr). But we believe that when chiseling is made in the direction away from the base of the skull, as has been done in our case, no shock can be produced, especially when one operates upon a mobile bone of the face skeleton.

The operation has given both an excellent cosmetic as well as functional end-result (last examination January 29, 1926): The scar of the operation was scarcely visible and the deformation of the face disappeared (Fig. 10). There remained only a slight lowering of the lower border of right half of the mandible, due partially to the widening of the jaw itself, partially to overgrowth and deformation of the alveolar process of the right maxilla: the teeth of the affected side being now in contact hinder the stump of the condyloid process from reaching the bottom of the glenoid cavity. It causes, however, no impairment of the function; the mouth can be opened to full normal width and normal power if mastication is present. The resection of the head of the condyloid process is the simplest way of curing such a deformity.

When are such cases to be operated upon? Is there any ground for waiting till the condition becomes stationary, as for instance, in the case of

Lohmann? On the base of the probability that the centre of the gravity of the condition is the epiphysis of the condyloid process being the very seat of the disease, we believe that in every stage of the development of the deformation we are able to control its progress and to cure the patient definitely by removing the affected part. The earlier the operation is done, the smaller the deformation will develop in the upper jaw and position of the teeth, requiring troublesome after-treatment. It is especially important in individuals during the time of the growth of the organism. We believe in such a case the earliest resection of the articular head is not only advisable, but even absolutely indicated.

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THE PREVENTION OF POST-OPERATIVE THYROTOXICOSIS BY POST-OPERATIVE IODINIZATION

By Joseph L. DeCourcy, M.D.

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Since the epoch-making discovery of Plummer, that iodine has specific affiliations with the treatment of exophthalmic goitre, a wave of enthusiasm has spread over the medical world. In spite of repeated warnings by men who are studying goitre in all its phases, huge doses of iodine have been thrust upon all sorts of goitre types in an unscientific manner and with more or less disastrous results. This, however, was to be expected, and follows in the wake of every phenomenal discovery. There are numerous observers, however, throughout the world who have been studying and experimenting with the true value of iodine and are slowly but surely placing it in its proper category. These men of vision have not underestimated its value, but by their conservative methods are preventing it from unwarranted discard, because of its reckless use.

Iodine, in the form of Lugol's solution, may be termed a temporary specific in exophthalmic goitre. That it has a permanent curative value has not been our experience and has not been claimed by Plummer or his associates. Whether we accept the theory that an incompletely iodized molecule is the underlying cause of the toxæmia in exophthalmic goitre or not is of little importance from a practical viewpoint. We do know, however, that when intelligently given, iodine will temporarily check the symptoms of toxæmia and will cause the patient to return to a normal balance and will allow them to regain in part at least, that which was lost. Because of this it has been found that this is an excellent means of preparing these patients for operation. Where formerly operations for exophthalmic goitre were dreaded by surgeons because of the resulting reactions shortly following and were frequently done in stages (ligations, etc.), it is now possible in many instances to do a safe one-stage operation and have very little resulting reaction. There are exceptions to this rule, however, and reliance on this method alone may give a sense of false security which may, not infrequently, lead to disastrous results. We must remember that we are operating on a patient with a goitre and not a goitre with a patient.

We have observed that if a patient has lost a great deal of weight and that the myocardium is unstable, it is still better to ligate the superior thyroid arteries, even though the patient has been iodized with Lugol's solution, than it is to do a primary thyroidectomy. By doing this the patient has a longer time in which to regain her strength, and will make a better recovery.

In patients of recent illness this is unnecessary. During the past year we did ligation in about 30 per cent. of our exophthalmic cases. This may seem

ridiculously high after reading reports from a number of clinics, but has seemed to be a factor of safety from which we could not deviate. We have also had a number of purely hyperplastic cases which did not respond to Lugol's solution. In two of these there was marked exophthalmos. We felt for a while that our clinical diagnosis may have been wrong, but they were verified by repeated sections.

Toxic adenoma has not been benefited in our experience, by iodine medication, and I believe in a number of instances it has made these cases more toxic. However, Lugol's solution has changed the handling of these cases in many instances.

In most goitre clinics it is considered more difficult to handle extreme toxic adenoma cases than any other type of goitre, including exophthalmic cases. Ligation is of apparently no value. Preliminary iodine medication is of no value, therefore it is extremely difficult to lessen the resulting reactions, which are not infrequently fatal. During the past year we have handled all of these cases in the following manner and have had no deaths, although a great many were in extremis and were suffering from decompensated goitre hearts before coming to us.

The patient is placed at rest in the hospital. If there is decompensation, sufficient digitalis is given (gtts. 10 every four hrs.) until compensation returns. If there is no decompensation and the heart-beat is regular, then the patient is digitalized with three doses of tincture digitalis of thirty minims each, about ten hours apart. A soft diet is given and they are encouraged to take large amounts of water and fluids.

One-half hour before operation the patient receives morphine gr. ¼, atropine gr. 1/150.

The operation is performed under nitrous oxide-oxygen and both lobes and isthmus are removed. The wound is left open and packed with saline gauze. As soon as the patient returns to bed she receives thirty minims of Lugol's solution per rectum. This is repeated in eight hours. Fluids are given per rectum and encouraged by mouth if they do not cause nausea. The following morning the wound is closed with gas anæsthesia, in the room.

We have noticed a remarkable improvement in the convalescence of these patients with an absence of the muscular tremor, tachycardia, restlessness, fever which was so common before. During the past year we have seldom seen the temperature exceed 100.5 rarely 101 and the pulse 120, and we believe that it is due entirely to the post-operative use of Lugol's solution. For these observations we now look upon post-operative thyrotoxicosis following removal of toxic adenoma the same as that following exophthalmic goitre and believe that both may be prevented by immediate post-operative iodinization.

It has become a pleasure to us in treating these cases which formerly caused so much concern, to now see their smooth and uneventful convalescence.

In the mixed exophthalmic and adenomatous gland, iodine has not been of value in the pre-operative treatment, but has been of distinct value post-operatively.

DISSECTION OF THE AXILLA IN RADICAL OPERATIONS FOR CANCER OF THE BREAST*

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There is a little danger, I think, perhaps more than a little in some parts of the world, a danger at any rate that the surgery of cancer in availing itself of radium and the X-ray, may be too much inclined to spare the knife.

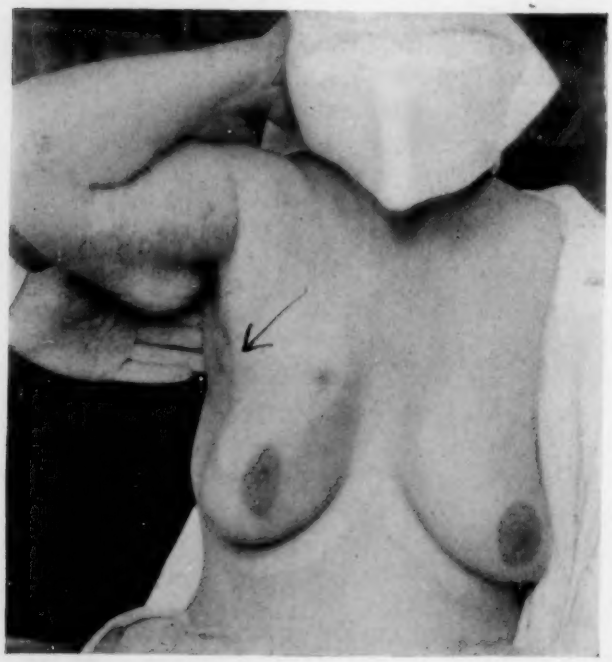

Fig. 1.—Involvement of the axillary skin in carcinoma of breast.

Certainly I am sure that this is true of the surgery of cancer of the breast, and by this I do not mean to deplore the attitude of those who are defining for themselves the field of operability. It is as unwise to attempt a radical operation on a case in which the incision passes through malignant tissue as it is to incise the malignant tissue in a half-hearted attack on a cancer in its early stage. Unfortunately, we are never quite in a position to say that a cancer of the breast is limited, but unless we are willing to give up the surgical attack, with the hope of removing all the disease, we must cling, in suitable cases, to the radical operation.

The radical operation for cancer of the breast should be one which surrounds, by its dissection, the area of possible affected tissue and ablates it without incising, disturbing, or in fact seeing any carcinomatous tissue. This is, and has been, the plan of the operation since the days of Banks and Gross.

Beginning with the incision, which surrounds the grossly visible disease, extending this to the axillary fascia and glands, then to the pectoral muscles and to the epigastric fascia, each advance has extended the range of dissection, yet for some reason all of these incisions have persistently ignored the fact

* Read before the New York Surgical Society, March 10, 1926.

that the dissection of the axillary skin at the very beginning of the operation invades an area, in fact the area of active lymphatic dissemination. To be sure in some cases it may be possible to reflect the skin of the axilla without reaching deep enough to invade the zone of advancing carcinoma, but Handley has shown how this lymphatic permeation extends from the larger lymph-vessels into the surrounding tissues and even up to the skin itself.

Handley says: "Stated in the most general terms possible, the object of the operation should be the removal, intact, of the permeated area of the lymph-vascular system which surrounds the primary growth and of the lymphatic glands which may have been embolically invaded along the trunk lymphatics of the area concerned. How are the limits of this permeated area to be defined? It is impossible to see it with the naked eye. The operator can therefore only aim at keeping a safe distance from it." This broad and sane principle laid down, he however proceeds to modify it in such a way as to practically nullify its use in practice. In discussing the removal of skin taken away in the operation, which should obviously be no larger than is necessary and no healthy skin should be removed. It has been shown that cancer does not spread in the planes of the skin, but nevertheless free removal of skin is necessary owing to the vertical extension to the skin after a time and over a small area of the growth which is spreading in the deep fascia.

FIG. 2.—The incision.

In an early case of carcinoma of the breast without evident axillary gland involvement, no gross invasion of the skin of the axilla will appear, but in many more advanced cases a close observation of the axilla will reveal retraction and even fixation of the skin to the deeper parts. It seems reasonable to suspect the presence of microscopic deposits in these tissues even in early

cases. Is it wise then to plan an incision which is intended to surround the disease so that it crosses and dissects this dangerous area?

There can be no doubt that in many cases in which this is done a local recurrence in the skin of the axilla reveals the fact that malignant tissue was left beneath the skin. The fact that in most of these cases generalized metastasis has occurred at the time when the skin involvement is noticed and is accepted as proof that the disease was beyond help from the first may perhaps be offered as another contribution to what Banks called, in 1871, the effect of inadequate surgery on the Theory of Cancer of the Breast.

FIG. 3.—The sutured wound.

Is it not possible that the invasion by the surgeon of an area in which young cancer cells are spreading may offer a rapid dissemination even in cases in which no local recurrence has time to appear?

It has appeared that the axillary skin should be considered as a dangerous area and removed in routine with the breast, the pectoral muscles, the entire axillary contents en bloc and a wide dissection of the deep fascia.

In the incision which I have now used in more than one hundred cases this is done and the skin of the lower axilla instead of being entered by the incision is removed in one piece. The skin is dissected back over the surface of the latissimus dorsi and is sutured in a Y so that the arm is not hampered.

In a series of seventy-two consecutive cases studied recently, sixteen were untraced, leaving fifty-four cases, of which thirty-six had passed the three-year point free of recurrence, a percentage of 66, three-year cures. There were 14, five-year cures—25 per cent., and it may be worth noting that I have not observed an axillary recurrence in any case.

In many cases of advanced cancer of the breast the skin of the axilla is found involved. In a smaller number of advancing cases early and low

involvement can be detected. It is logical to suppose a microscopic invasion in comparatively early cases. It is the custom to ignore this fact and to plan incisions for the radical cure of cancer which invade, cross or dissect the skin and superficial fascia of the lower and middle axilla. The scars of such trans-axillary incisions are frequently the site of local recurrence and it is fair to suppose that a wider dissemination of the disease has been favored by such an operation.

An operation is offered in which the skin incision surrounds the skin of the axilla and in which the axillary skin, fascia and glands are removed en bloc with the pectoral muscles and a wide area of deep fascia. The cicatrix of this operation does not limit the motion of the arm.

It is recognized as a general principle that attempts at radical surgery of cancer of the breast should be planned to completely surround the disease. This operation is offered as a more complete compliance with this demand.

A STUDY OF THE ACCESSORY PANCREAS

WITH REPORT OF ONE CAUSING CONGENITAL PYLORIC STENOSIS

By Kelley Hale, M.D.

of Wilmington, Ohio

Klob, in 1859, was the first to describe an accessory pancreas. Two years later the second paper on this subject bore the illustrious name of F. A. Zenker.[2] Although this subject was given such an early and fine start, little has been written upon it until after 1900. A. S. Warthin,[17] Arthur Benjamin [43] and E. J. Horgan [50] have written outstanding papers.

At first, the presence of an accessory pancreas was thought to be of academic interest only; but as the abdomen is being opened constantly now, the clinical importance of an aberrant pancreas is being shown. A number of serious and even fatal cases have been reported. I think that I will be able to show that it is an etiological factor, if not the sole cause of congenital pyloric stenosis.

In reviewing the literature on the subject of accessory pancreas in the library of the Cincinnati General Hospital, I kept the above idea in mind.

In 1904, Warthin found 47 cases in the literature and added 2. Up to 1921, 31 cases were added. Twelve cases were found at operation. A number of patients have been operated upon for this trouble since then. Horgan found 2 cases in 321 consecutive autopsies while Opie [16] reported 10 cases in 1800 autopsies.

Locality of Accessory Pancreas, Warthin, 1904:

	Cases		Cases
Wall of stomach	14	Diverticulum of jejunum	1
Wall of duodenum	12	Diverticulum of ileum	4
Wall of jejunum	15	Meckel's diverticulum	1
Wall of ileum	1	Umbilical fistula	1
Wall of intestine (not definite)	1	Mesenteric fat	1
Diverticulum of stomach	1	Omentum	1
		Total	49
		Location	53

Horgan from 1904–1921:

	Cases		Cases
Stomach	5	Small intestine	1
Pylorus	2	Diverticulum of intestine	4
Jejunum	13	Diverticulum of duodenum	2
Duodenum	3	Splenic capsule	1
Ileum	1	Total	32

Nine papers have been written since Horgan's of 1921. An aberrant pancreas of the gall-bladder [58] and pancreatic bladder of a cat,[53] due to accessory pancreas, have been added to diversify the above locations.

Etiology.—The cause of aberrant pancreas at once resolves itself into one of speculation, based entirely upon a consideration of the origin and embryological development of the pancreas from two ventral and one dorsal anlages or matrices. Just how an accessory pancreas becomes separated from the main mass or masses of pancreatic tissue and develops into small but complete functioning organs with ducts, acini and islands in most instances, is hard to explain; especially when we consider their wide distribution.

Horgan does not agree with Zenker's theory of origin from an additional diverticulum causing a single independent gland mass. He states his objections as follows: "The masses would be large and would be found always in the duodenum, whereas, in fact, all the aberrant masses are small and the accessory tissue has been found in the stomach, duodenum, jejunum and ileum, spleen, splenic capsule, mesentery, omentum and umbilicus." Horgan does not think that aberrant pancreatic tissue conforms to Cohnheim's theory of embryonal rests.

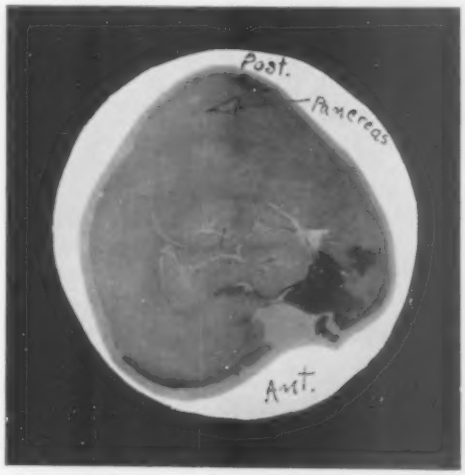

FIG. 1.—Low power, showing cross-section of pyloris, in a case of congenital pyloric stenosis. Also severed circular fibre and a triangular aberrant pancreas outlined in ink.

Warthin thinks, "It is more probable that accessory pancreatic tissue is formed from lateral budding of the rudimentary pancreatic ducts as they penetrate the intestinal wall, the mass of pancreatic tissue thus formed being snared off and carried by the longitudinal growth of the intestine, either upward or downward."

After a study of the embryology of the pancreas, it seems to me that embryologists, pathologists and surgeons have been content to start their study of the pancreatic origin at the point where the anlage or diverticula appear. Back of this point nothing is said about the cells that constitute the walls of the diverticula.

The study of the origin of the spleen as given by Prentiss will shed some light on a possible and like origin for aberrant pancreatic tissue outside of the duodenum. The following is quoted from Prentiss: "The spleen appears in embryos about 10 mm. as a swelling on the left side of the dorsal mesogastrium near the dorsal pancreas. The thickening is due to a temporary proliferation and invasion of mesothelial cells into the underlying mesenchyme, which, meanwhile, has also undergone local enlargement and vascularization."

Now in embryos of 3 to 4 mm. pancreatic anlages are already developed. Therefore to account for those cases of aberrant pancreatic tissue in the spleen and capsule of the spleen, we must assume that a primordial pancreatic cell

migrated into the dorsal mesogastrium developing into an accessory pancreas along with the spleen. Accessory pancreases located in the great omentum, mesentery, gall-bladder, Meckel's diverticulum and umbilicus can be accounted for in a similar manner. A few years ago, I found an accessory spleen the size of a pea in the great omentum just below the transverse colon. Sections proved its identity.

It is said that the various stages of embryologic development of the pancreas can be found in vertebrata from the lowest form of fish up to man.

Pathology.—The pathologic changes reported in a number of cases have necessitated surgical intervention. They have been chronic interstitial inflammation with and without localized fat necrosis in the surrounding tissue; acute pancreatitis; malignant adenoma of the pylorus with obstruction originating in aberrant pancreatic tissue; tendency to intussusception of jejunum; intestinal obstruction from pancreatic tissue in intestinal diverticulum. Harry Cohen [52] reports a case of ulcer of the pylorus due to accessory pancreas. A number of writers have thought of the possible irritation of the pancreatic juice. Since most of the pancreatic nodules which average 1 cm. in diameter (4.5 cm. largest) are located in the walls of the stomach, duodenum or small bowel, usually in the muscular coats, but sometimes just beneath the mucosa; and since eight of Horgan's and two of Warthin's reported cases did not have ducts, we must consider what are some of the effects of this chemical irritant.

In two cases reported by Carwardine and Short [49] there was great thickening of the jejunum and duodenum. One patient died of pyloric obstruction which they attributed to cancer of the pylorus. No autopsy. It could have been due to muscular hypertrophy due to irritation of pancreatic juice.

In Horgan's two cases there was increase in the interlobular, interacinous and periductal connective tissue. All of the glands located in the bowels have a peritoneal outer covering, that is, in the outer muscular layer.

Hedry [59] removed an aberrant pancreas from the upper jejunum. The bowel had evidently been irritated for years by the secretion.

My own case of accessory pancreas is herewith reported.

H. W.; white, male, aged six weeks, who was the second child of his father and the first of his mother, appeared to be normal in every way at birth and had no trouble with his feedings which were from the breast as long as he was in the hospital, which was two weeks. During the third week of his life, he began to vomit, which was projectile in character. Various formulas were tried by the attending physician, Dr. V. E. Hutchens, but the vomiting persisted until the physician became suspicious that he was dealing with pyloric stenosis. The patient was taken December 26, 1926, which was during the sixth week of his life, to Doctor Lamb, of Cincinnati, who confirmed the diagnosis of congenital pyloric stenosis. I was called the day following to operate upon the child at the Children's Hospital, Cincinnati.

Operation.—Rammstedt's operation was performed in the following manner: A right rectus incision was made over the pylorus. (I had felt the child's pyloric region a few days previously and thought that I could detect something but was not sure.) The mass that had been previously felt was above and just to the right of the umbilicus about

an inch. On introducing my index finger into the abdomen, the hard mass was encountered about the size of my thumb at this point. It was grasped with sponge forceps and brought up within reach and withdrawn from the abdominal cavity. The pylorus was enlarged to three-quarters of an inch in diameter and one and one-quarter inch long. With the mass supported between the thumb and index finger of the left hand, the fibres were carefully divided with a small nasal septum knife, the inner fibres were broken apart by stretching the incision with a pair of Kelly hæmostats, permitting the submucosa to bulge into the incision and thereby afford relief from the stenosis.

FIG. 2.—Showing low power microphotograph of a triangular-shaped accessory pancreas embedded in the musculature of congenital pyloric stenosis.

The tumor was solid, light in color and gave one the impression of cartilage as the fibres were cut and divided. It was friable, making it difficult to ligate the bleeding points. A cartilaginous ring shading off into the stomach and the duodenum would describe the gross pathology accurately.

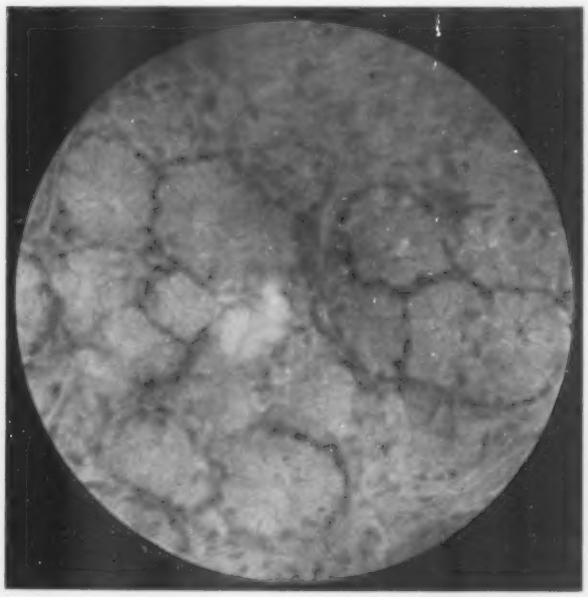

FIG. 3.—Showing high power microphotograph of Fig. 2.

The bleeders at each angle of the incision were controlled by hot packs and ligatures of silk. The pylorus was then dropped back into the abdominal cavity and by means of a retractor, it was observed for hemorrhage. No hemorrhage being noticed, the abdomen was closed. Chromic catgut was used for the peritoneum. Three stay sutures were introduced, going through the fascia; and this layer and the rectus muscle were closed with interrupted sutures of chromic catgut. Michel's clips united the skin and the stay sutures were secured over a strip of gauze saturated with alcohol. A sterile dressing was applied.

Result of Operation.—The patient's pulse was good immediately following operation. He retained water and his feedings. Next morning, Doctor Lamb noticed the patient was

pale and also noticed some oozing on the dressings and ordered hæmostatic serum. About noon Doctor Lamb called me, stating that the baby was in a very critical condition. I ordered a transfusion of blood, but the patient died before the order could be carried out.

We were permitted to reopen the incision and examine the pylorus. There were several sponges full of free blood and a small blood clot the size of a hazlenut. The mucosa at the site of operation was intact. The pylorus with adjacent stomach and duodenum were removed for microscopic examination.

Miss Kathryn Williams, pathologist to Kelley Hale Hospital, made serial sections of the pylorus and noted a small nest of glands located in the muscles at the posterior side of the pylorus.

Figure 1. A low power picture of a cross-section of the pylorus 1.6 cm. in diameter, showing the greatly thickened muscular wall severed by the Rammstedt operation; also the location of the misplaced pancreatic tissue which is on the opposite (posterior) side to the divided fibres. The muscle wall at this point is 6 mm. thick. The accessory pancreatic tissue, triangular in shape 1 mm. by 0.5 mm., lies 2 mm. from the surface of the pylorus.

Figure 2 shows photomicrograph of triangular area of aberrant pancreatic tissue. Ocular No. 1 Obj. 2/3. As can be seen there is a great increase in the thickness of the interlobular connective tissue while the cells of the interacinous tissue are enlarged and have large deeply staining nuclei which make the acini stand out as if outlined by a pen. The cell walls of the acini cells are clear cut and the cytoplasm clear; but the nuclei are more or less indistinct, although some are well-stained and clear cut.

Seven sections show pancreatic tissue. In some the lobules are isolated and of different sizes; all smaller than Fig. 2. A number of isolated acini are clearly delineated and there are a few areas composed of light clear cells which I take to be compressed and distorted acini. There is a large thick-walled artery in the field, but no evidence of ducts can be made out. I found one islet of Langerhans. No inflammatory cells were noted within the pancreatic tissue or hyperplastic muscle coats.

Longitudinal sections of the pylorus showed large bundles of hyperplastic muscle fibres. The connective tissue surrounding these bundles was œdematous but not increased in amount. There were œdematous spaces as large as the individual muscle fibres and about in equal proportion, giving the appearance of a very fine sieve under low power of the binocular microscope. The diameter of the mucosal area is 5 by 8 mm. The submucosa is thickened and the nuclei of the cells are large and take a deep stain. The cells of the mucous membrane are clear cut and stain beautifully. The blood-vessels show thickening of all the coats. The cut ends of the circular fibres are separated as shown in Fig. 1.

Comments on Case.—1. The pathologic picture conforms in every detail to that of congenital pyloric stenosis as does the clinical findings.

2. The aberrant pancreas is 4 mm. from the lumen of the pylorus with no evidence of ducts.

3. Many writers agree that pancreatic secretion can produce chemical irritation as proven by case reports.

4. I believe that the activity of the cells of the aberrant pancreas described before, irritated the musculature of the pylorus in this infant to such an extent as to cause pathologic changes in this case.

5. I do not think that congenital pyloric stenosis is due to spasm; but I believe, as does John Chadwick Oliver, as he states, "Like most functional disturbances, investigation will probably show a direct underlying cause." I feel that I have discovered it in my own case at least. Doctor Dudley Palmer states, "All cases of congenital pyloric obstruction have a constant

pathology that rests on a far more tangible basis than any 'spasm' theory. The spasm explanation is too elusive to satisfy the materialistic doctor of to-day."

6. I can not believe that it is a coincidence to find an aberrant pancreas and typical pyloric stenosis together.

7. I would suggest that serial sections be made of any pylorus removed at autopsy showing congenital stenosis to determine whether or not my assumption is correct.

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EXTERNAL FECAL FISTULA FOLLOWING APPENDICITIS*

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As a result of many years of close fighting acquaintance with that arch-enemy of mankind, acute appendicitis, it has been my custom to state that the pathological possibilities of acute appendicitis are without limit. Its depredations lead into many and diverse paths. It is my purpose in this paper briefly to call attention to one of these paths—fecal fistula—which is among the most unpleasant complications, mentally as well as physically, which the victim of an acute appendicitis may be called upon to bear. These patients often feel themselves outcasts from polite society and are prone greatly to magnify their more or less fancied repulsiveness. The incidence and methods of relief are, therefore, of no mean interest and importance.

Fig. 1.—Fecal fistula following appendicitis.

The local as well as the general results of fecal fistula depend upon the distance of the fistula from the stomach and the amount of intestinal contents that escapes. A fistula of the large bowel does not impair the general health, which is also true to a large extent of fistula of the extreme terminal ileum; but a fistula high up in the small intestine will cause death from inanition, therefore operation cannot be made too early.

Much is to be learned by careful examination of the intestinal discharge, the responsibility for which is left to the research laboratory, where careful chemical and other examinations are made. In small intestinal fistula the surrounding skin is inflamed, excoriated or becomes digested, a very painful condition and one that it is difficult to relieve. (Fig. 1.) The odor of the discharge is not necessarily characteristic of a fecal fistula, since colon bacillus pus also gives a fecal odor.

Two years ago I reviewed this same subject on the basis of cases occurring

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at the Lankenau Clinic. I am now presenting additional cases, bringing the cases up to date.

Fecal fistula as a complication of acute appendicitis, with the exception of an occasional spontaneous rupture of an appendiceal abscess and fistulous formation, which I have seen, is limited to operations in which drainage was used, either gauze surrounded by rubber dam, rubber dam, cigarette drains, glass or rubber tubes. Experience fails to reveal any prophylactic measures in the way of placing such drainage. It occurs with equal frequency whether gauze or rubber is used and almost exclusively where ulceration and erosion of the adjacent bowel by abscess formation and pressure were present at operation. There seems also to be an especial tendency to fistulous formation in cases where the appendix is perforated close to the cæcum. This tendency no doubt is due to the difficulty in inverting the appendiceal stump and the friability of the tissues which must be depended upon for reinforcement. No doubt in many instances stitches pull out, either as the result of tissue necrosis or of peristalsis, leaving the everted lips of mucous membrane free to spout forth the fecal stream, as the restraining ligature is absorbed or dissolved. Great care therefore is required in removing the gauze drainage. This should be done steadily and as gently as possible, at the same time the cavity should be flushed with normal salt solution to assist in softening and dissolving the secretions.

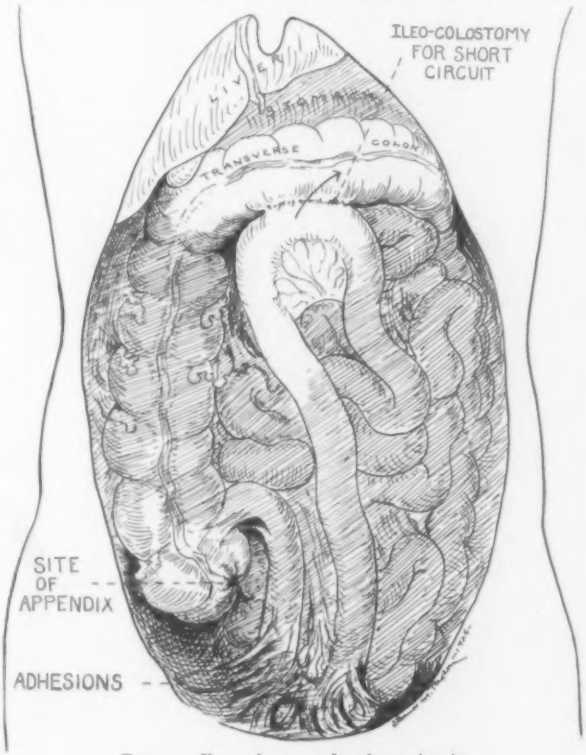

FIG. 2.—Ileo-colostomy for short circuit.

The possibility of fecal fistula, however, does not deter me in the plentiful use of drainage in suppurative appendicitis. I have long been in the habit of thoroughly draining such cases, leaving the wound wide open, bridged only by a few retaining sutures. The resultant hernia can be cured, on the principle that a living man with a hernia is better than a dead man without a hernia.

During the past year at the Lankenau Clinic there were six deaths among three hundred and three (303) cases of acute appendicitis, a mortality of

minus 2 per cent. Included among these admissions there were many of the worst possible type of cases.

On opening the abdomen in a case of appendiceal suppuration, the

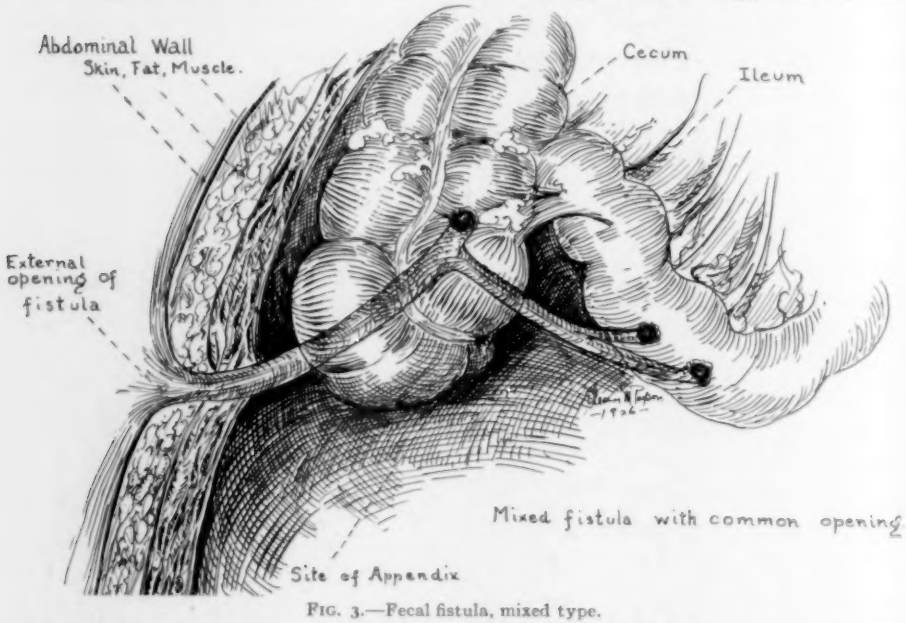

FIG. 3.—Fecal fistula, mixed type.

surgeon often meets with an alarming degree of ulceration of the terminal ileum and cæcum, frequently associated with a mass of adhesions and conse-

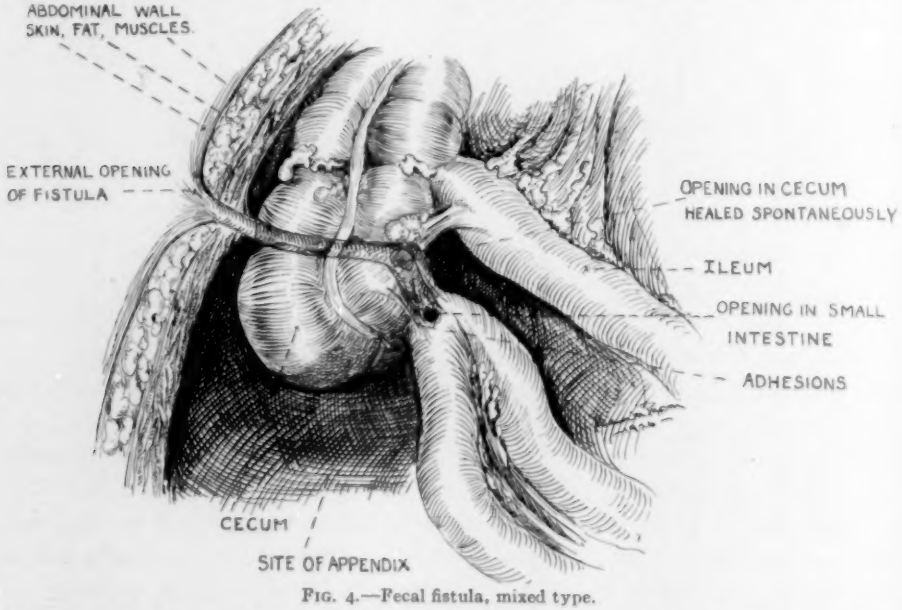

FIG. 4.—Fecal fistula, mixed type.

quent angulation of the bowel. This last named is especially apt to occur where a pocket of pus is present in the pelvis. Much too often one also here finds

one or more knuckles of ileum plastered down in the cul-de-sac, release of which is tedious and dangerous. In recent years, in cases of such angulation or where repair of the ulcerated area has markedly encroached on the lumen of the bowel, it has become an increasingly more frequent practice with me to finish the operation with an ileocolostomy making the anastomosis at a point above the affected small bowel to the transverse colon, and in some instances in addition one or more entero-enterostomies. (Fig. 2.) This provides a safety valve for the bowel and in turn prevents intestinal obstruction and very often too a fecal fistula; or, if a fistula does form, as occasionally happens, permits of spontaneous closure of the fistula, except in rare instances. I have often observed such cases, where an ileocolostomy was not performed, develop symptoms of intestinal obstruction between the second and the tenth days, or even later, necessitating a second serious operation or else nature has relieved the obstruction by a fecal fistula which averts immediate operation. But a large proportion of such fecal fistulas require surgical repair since spontaneous closure is rare because of the more or less permanent partial obstruction, the original cause of the fistula. When I return to the wards each day I view these ileocolostomy and entero-enterostomy cases with a feeling of cheerful confidence in contrast to the forbidding apprehension which the cases present where the anastomosis has not been made.

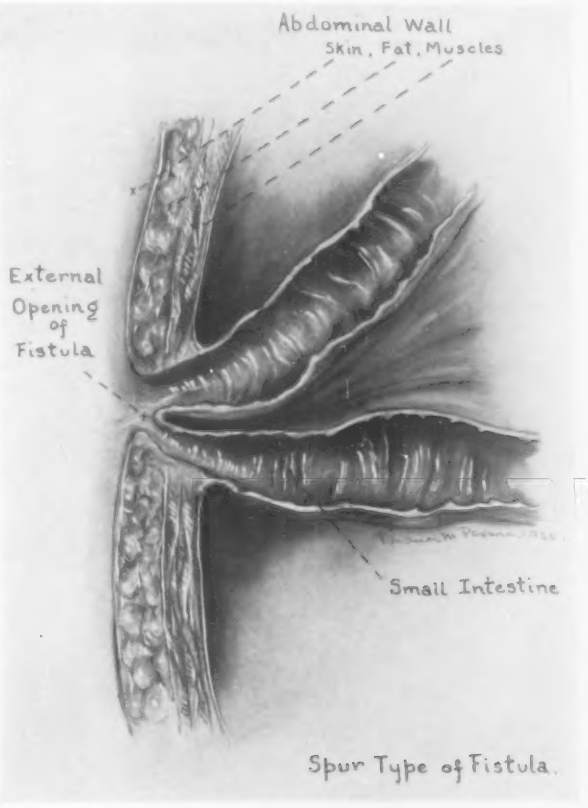

FIG. 5.—Fecal fistula, spur type.

In a small percentage of mixed fistulas (Fig. 3) sometimes two or more operations will be necessary to bring about permanent closure, unless one is bold enough to make an extensive resection with the risk of overstepping the margin of safety in these usually much debilitated patients. I have on occasion made two or three operations with most happy results, as instanced in the case of the patient I am herewith reporting.

The patient, aged forty-seven years, was admitted to the Lankenau Hospital, August 4, 1925, with diffused appendiceal peritonitis. Lower abdominal tenderness was marked on both sides, the belly was silent with inability to pass gass or to void urine. Treatment consisted of anatomic and physiologic rest until August 15, when the diffused peritonitis had subsided, and there remained a circumscribed peritonitis, with flatus on percussion and extreme tenderness over this area. Operation was done under intra-spinal apothesine, and a perforated appendix found lying lateral to the cæcum and ascending colon; pus was present between the diaphragm and liver, lateral to the colon, in the pelvis with two small collections between the coils of the small bowel adjacent to the cæcum. The pus was evacuated and the appendix removed. A large sheet of thick rubber dam was placed medial to the ascending colon and the cæcum and extending into the false pelvis, and the wound gently packed with iodoform gauze. Rubber tubes were placed between the diaphragm and the liver, beneath the liver and in the pelvis. The wound was left open and several interrupted sutures placed, simply to hold the drainage in place and lessen the chance of evisceration in the event of vomiting or coughing. Where lavage is practiced in these cases the wound is looked at before and after the stomach washing to insure against overlooking prolapsed bowel or omentum. Failure on the part of the nurse and interne to make this survey nearly cost the writer a thousand dollars in one instance. Recovery from operation took place but later two fecal fistulas developed, one of the cæcum and one in the small bowel in which there were two openings in the terminal ileum.

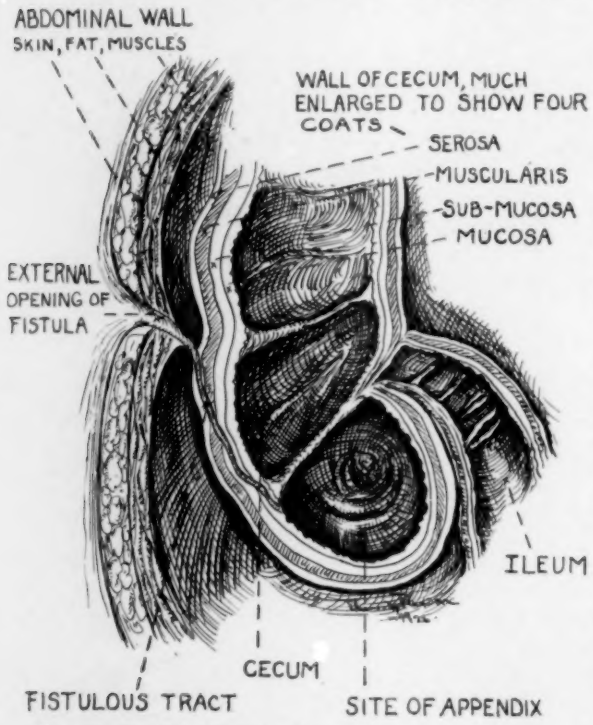

FIG. 6.—Fecal fistula running through each coat of wall or cæcum. (Diagrammatic.)

October 10.—I again operated under spinal apothesine, for repair of the fistulæ. The openings were closed with interrupted Lembert chromic gut sutures. Several questionable areas in the small intestine were reinforced with sutures. The operation was terminated by making an ileocolostomy and the wound dressed in much the same manner as after the first operation. The patient recovered but a fistula recurred three weeks later. The third operation was made on November 26 under spinal apothesine, gas and oxygen anæsthesia. The operation consisted of excision of the terminal ileum, cæcum and ascending colon. Complete recovery took place. The patient has been heard from recently and is perfectly well.

Suturing a fistulous opening when it is surrounded by granulation tissue does not accomplish anything, neither does packing the sinus with the idea of inverting the margins of the opening in the bowel and promote healing, accomplish the desired end. My internes occasionally make one or other of these

attempts at closure, to which I do not take exception, not wishing to dampen their enthusiasm or stay their ambition. Occasionally, however, healing occurs in the case of a small fistulous opening at the bottom of a long tract surrounded by granulation tissue. When the fistulous tract opens into the cæcum and into the small intestine through one or more openings, making a mixed fistula, operation is the only alternative. Occasionally the opening in the large bowel closes spontaneously, but never do the small bowel openings close. (Fig. 4.)

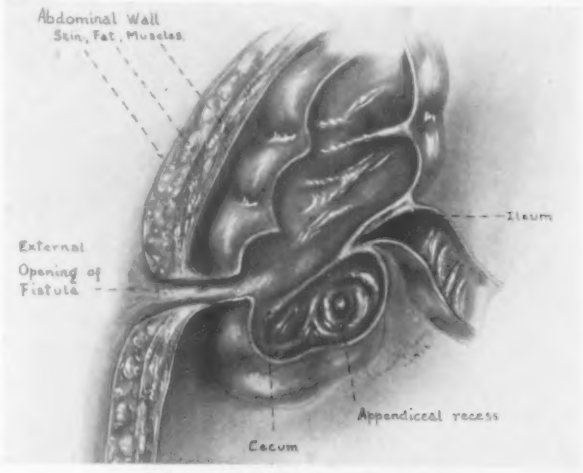

FIG. 7.—Fecal fistula, simple type.

One of the drawings I present is of a mixed fistula upon which I operated this afternoon; the opening in the cæcum had closed, therefore I had only to close an opening in the small intestine, making the operation simple. Mixed fistulas with large and small bowel openings can be recognized by the skin irritation which they cause, as fistula of the large bowel is not accompanied by skin irritation. (Fig. 5.)

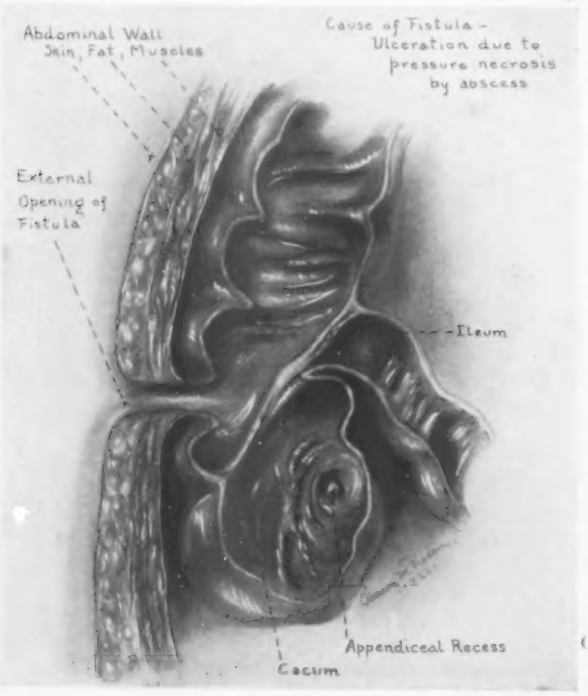

FIG. 8.—Fecal fistula, simple type.

Occasionally I meet with a tiny fistulous tract communicating with the cæcum with a valve-like opening, the tract passing obliquely through the coats of the bowel, the terminal part of the fistulous tract extending some distance beneath the mucous membrane before entering the lumen. I I have recently operated such a case where neither gas nor fecal matter passed through the fistula. (Fig. 6.)

Records at the Lankenau Clinic reveal two hundred and twenty-two (222) cases of post-appendiceal fecal fistula, occurring among four thousand, six hundred and fifty-five (4655) cases of acute appendicitis, an incidence of slightly less than 5 per cent.

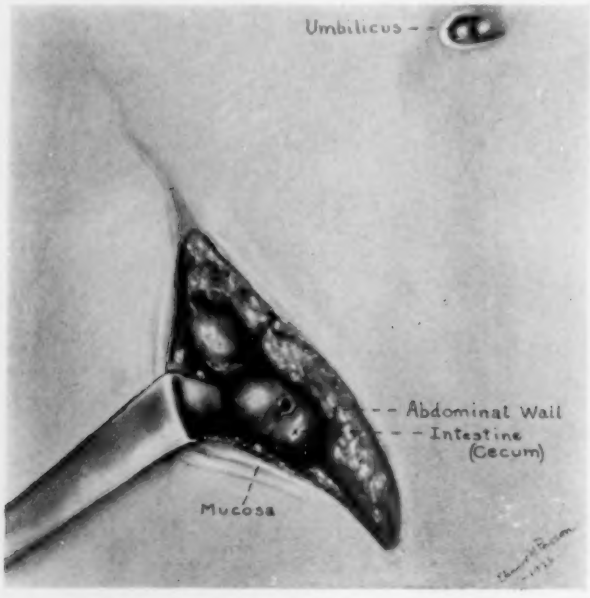

FIG. 9.—Fecal fistula following appendicitis.

Of these 222 fistulas, 86 or 39 per cent. healed spontaneously, while 108 or 49 per cent., required operative repair. The remainder, 30 or 13.5 per cent. were discharged from the hospital having refused operation, or were sent home to recuperate and to return for operation if necessary, but failed to do so. On the basis of figures gathered by the Lankenau Follow-up Department, the greater number of these fistulas probably closed spontaneously and may be included among that number.

The shortest duration of fecal drainage in this series of cases was one case in which the opening closed twelve hours after its presence was discovered, while the other extreme shows a patient who had an intermittent fecal fistula for nine years. As a rule a trial period for possible closure was permitted to pass before operative procedure was undertaken, the length of time depending upon the patient's general physical condition, the amount and character of the drainage and the mental attitude of the patient.

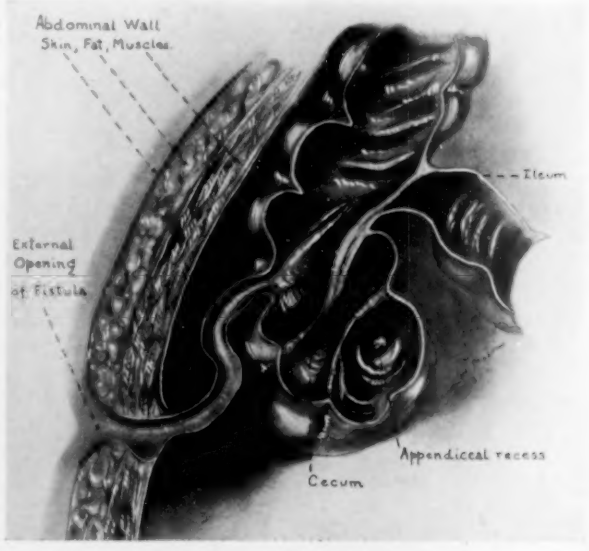

FIG. 10.—Fecal fistula.

The surgical procedure necessary for repair was dependent of course upon

conditions. In 55.5 per cent. of cases, simple inversion of the fistulous opening by a purse-string suture followed by reinforcement by an additional suture line was the only procedure required. In 15 per cent. of cases the condition of the bowel after this procedure was such as to excite doubt as to its regenerative power in the presence of the usual fecal stream, so that an ileocolostomy was performed to short-circuit the affected bowel. Twenty-three per cent. of cases presented either multiple fistulas or else the fistula was so large as to preclude closure with maintenance of the lumen of the bowel. Some cases showed extensive ulceration in the part of the bowel surrounding the fistula, so that hope for the recovery of this portion had to be abandoned. These required resection of the bowel varying from a small portion of the cæcum to resection of a foot or more of the terminal ileum with the cæcum and entire ascending colon. Ileocolostomy was of necessity the last stage of the operation.

Of the 108 operated cases, 89 were discharged from the hospital perfectly healed. In ten instances there was a recurrence of the fistula. These usually healed spontaneously, but in some instances required further resection of the affected portion of the bowel. (Figs. 7, 8, 9 and 10.)

THE PATHOGENIC COLON*†

By John William Draper, M.D.
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The occasional hereditary transmission of certain psychopathic disorders, including epilepsy, has long been an acknowledged fact. The mechanism of transmission has remained an enigma. From time out of mind the inheritance of epilepsy and the so-called functional psychoses has been accepted as an inescapable yoke, passing from generation to generation, and because of our age-old dualistic habit of separating the mind or soul from the body, and of our ignorance concerning the basic laws of heredity it sufficed loosely to concede the transmission of these disorders to the mind. This popular trend of thought away from Virchow savors of mystery and medieval medicine. It is not new. Of all the ancients, the Greeks alone rejected it.[1] From the modern biological point of view such an explanation is inadequate. One has only to read Conklin [2] or Morgan,[3] or to believe in Virchow, to be convinced that since there can be no function of any kind without form just so surely there can be no abnormal function without abnormal form. The origin of abnormality in cerebral cellular form is of necessity either congenital or acquired. It is with the acquired or secondary form that we are concerned, because here an hereditary element which may respond favorably to surgical treatment is often to be found within the abdomen.

The primary or congenital cerebral abnormalities are worthy of more than passing consideration, even though in a biological sense we cannot expect to modify them. Much careful research has been made upon these primary abnormalities of the brain, and it has long since been demonstrated that definite forms of idiocy result from gross and easily recognized congenital cerebral defects. Less severe abnormalities account for the ordinary moron and the so-called constitutional defective. Their symptoms appear soon after birth and post-conceptional environment cannot materially change or improve them.

The secondary or toxic form of cerebral cellular disorder is to be found in those adolescent individuals who have been bright and normal since birth and who have suddenly developed epilepsy or a so-called functional psychosis. The family history may be entirely negative, save that it points frequently to chronic intestinal invalidism. The personal history and physical findings often demonstrate extensive chronic focal infection throughout the body, and not infrequently what has been called a "surgical abdomen." Should such patients, because of mental disturbance, be denied a thorough medical examination and surgical defocalization such as is practiced everywhere for the

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† Aided by a Grant from The Andrew Todd McClintock Foundation.

relief of many common disorders? Wertheimer,[4] in discussing American psychiatry, disposes of the question as follows: "The numerous operative procedures represent a degeneration of the pragmatic attitude." Insanity in this country has increased 468 per cent. since 1880, while our population has increased 112 per cent.[5] May it not be that our failure to check this rising tide of human waste is due in large part, not only to defects in the established methods of treatment, but also to the utter lack of a comprehensive and biologically correct preventive program? The effect of heredity upon the incidence of insanity is not definitely known, but we do know that in some patients hereditary factors exist which predispose to bacterial or other forms of toxicosis, and which are susceptible to surgical intervention. Surely the physical and biological side should not be lost to view in the present effort to stress psychical therapeusis, for there is no reason why the two forms of study and treatment should not be combined.

The hereditary transmission of intra-abdominal defects is today an unexplored field, but it is probable that it conforms to the Mendelian law. Recent study shows that such defects, notably of the colon and omentum, are of frequent occurrence among psychotic and epileptic patients and that they favor the development of an abnormal and destructive flora in the colon. They may also offer a satisfactory explanation of the mechanism which transmits neuropsychoses in certain families not known to harbor primary cellular defects of the brain. No one can successfully deny that in such families there may be slight congenital abnormalities in the cerebral cells and that these, although not demonstrable, may be present without causing symptoms excepting when complicated by the toxins of focal infection. The sources of these toxins are demonstrable and will yield to surgical and medical therapeusis. Primary defects of the brain, if present, cannot be changed by treatment. The questions of tissue susceptibility and bacterial specificity are of the utmost importance, but beyond the scope of this paper.

A colon dysmorphism due to congenital bands and other developmental abnormalities is incompatible with the gravitational drag of the upright posture and is therefore unfavorable to the continuance of the water and gas-tight colon with which we are born. For such dysmorphisms, seemingly hereditable, often cause partial obstruction, abrasions and pressure traumatism to the colon tissues, resulting in permeability, destructive ulceration, chronic peritonitis and the symptoms of chronic intestinal invalidism. Davenport,[6] commenting upon certain of the histories and findings pursuant to this research, says: "While not yet definitely proven, these studies upon the possible transmission of dysmorphism in the human colon in families are of very great interest and importance. I regard them as a valuable addition to our general knowledge regarding the relationship of heredity and environment, and am therefore publishing a part of your report in the *Eugenical News*."[7]

Of the one hundred and seventy-six cases analyzed in this report, and

exclusive of the group of one thousand referred to later, one hundred and sixty-four are from the surgical clinic and the laboratory of the State Hospital for the Insane at Trenton, New Jersey. Of this group, one hundred and forty-nine were psychotic and fifteen were epileptic. The remaining cases were taken from the private files of the writer, and in addition to epilepsy deal with the more generalized symptoms of chronic invalidism. The surgical analysis of the State Hospital cases was made by John W. Churchman, who at the time was in charge of the hospital laboratory. The work as a whole has been under the direction of Henry A. Cotton.

FIG. 1.—Method for closing mesenteric defect and sealing retroperitoneal space.

From a careful study of the functional psychotic group admitted to the State Hospital during the past eight years, it is evident that each patient presents a greater or less degree of focal infection throughout the body, and that serious lesions of the colon exist in fully 30 per cent. The great majority of these lesions are due to dysmorphisms of the congenital type, the remainder to deformities of inflammatory origin alone. Both causes are often present concurrently. Four years ago James Ewing [8] examined sixteen specimens of colon and ileum chosen at random from the material under discussion. He says: "The great majority of the specimens show very definite gross anatomical lesions. . . . The most marked is pigmentation, excessive in the cæcum, but often present throughout the specimen. This pigmentation is fully recognized as a sign of chronic intestinal stasis and intoxication. It is sometimes associated with anemia, and at times with severe and even fatal dystrophies of the nervous and muscular systems.

"Pouching of the intestinal wall amounting almost to hernial protrusions was observed in most of the cases. The wall was sometimes very much thinned, and the mucosa at the bottom was generally eroded, sometimes ulcerated. Through such erosions it is obvious that absorption of fluids and bacteria readily occurs.

". . . In general the impression gained from the study of these specimens was that the clinicians were dealing with extensive and somewhat unusual

grades of chronic intestinal stasis and catarrhal inflammation with its sequels. . . . Important is the demonstration of hernias, pouching, thinning of wall, pigmentation and ulceration of the mucosa, which together form an impressive anatomic basis for the theory of intestinal intoxication, which undoubtedly existed in severe degree in the cases exhibiting such lesions."

Doctor Ewing's full report, from which the above is abstracted, is an important document. These details are offered to explain something of the hypotheses which have served as guides in the study of the present series and to show that this work upon the colon far from being haphazard, has been carefully coördinated with well established biological laws and with conservative laboratory findings.

FIG. 2.—Method of tying the interrupted sutures.

The colon specimens belonging to this group, and from which Doctor Ewing's studies were made were removed by the usual technic. It comprised a closure of the peritoneum across the pelvis. This obliterated the mesenteric defect between the termination of the ileum and of the sigmoid, but it necessitated evisceration in order to dislocate the small bowel from the pelvis and often led to post-operative complications. Its most objectionable feature, however, appears to have been that the long suture line extending over the entire area of extirpation was incompletely closed. Coffey [9] has recently published a method illustrating its closure. The pertinent mortality in the hospital series of one hundred and sixty-four cases was 31.7 per cent. As this was seriously high the technic has been changed as follows: The colon mesentery is left as long as possible and the suture ends are gathered together as shown in Figs. 1 and 2. The mesenteric defect between the terminal ileum and the terminal sigmoid is then closed as shown in Fig. 3. The result of this is to shut off almost completely the entire retroperitoneum, which under the older technic had been left relatively open to infection. The heterostaltic lateral anastomosis is used as heretofore. Since the introduction of this simple change the pertinent mortality in an unselected continuous series of twenty-five hospital and private cases has fallen to 16 per cent. E. C.

Dudley,[10] commenting upon the resemblance of the mesenteric closure to his own well-known approximation of the pelvic floor after hysterectomy, and which is generally credited with having reduced the mortality of that operation by fully 20 per cent., has said that, employed as above described, it would, in his opinion, ultimately result in lowering the mortality of total colectomy to less than 5 per cent. To Doctor Dudley I am deeply indebted for constructive criticism.

The general problem of the pathogenic colon and its treatment, although recognized as important, is as yet little understood. The following tentative conclusions, based upon study of this series, may therefore be of some value.

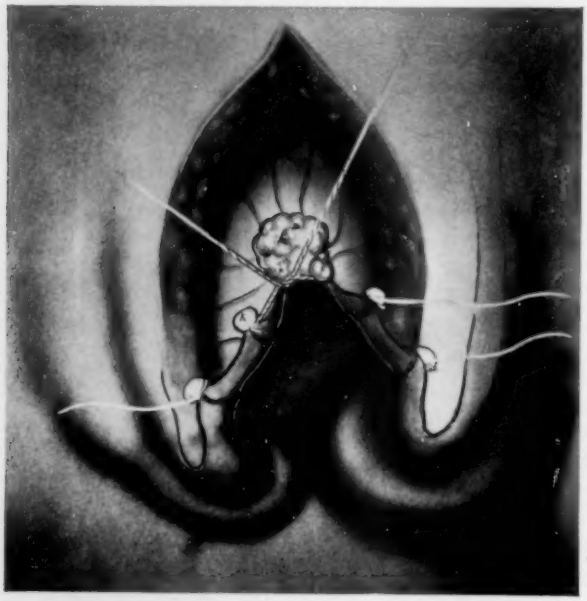

FIG. 3.—Mesenteric closure nearly completed, and retroperitoneum shut off.

Chronic peritonitis, manifested by cicatricial scars upon the mesentery and associated with the breaking down of mesenteric glands, is frequently present. It does not cause much pain and is not associated with fever. It is related to the low blood pressure and hæmic changes reported by Draper and Johnson,[11] and is probably the direct result of leakage of bacteria and their toxins through the mechanically damaged colon, as cited by Ewing. Indeed if at operation the serous surface of such a colon is gently stroked after a rectal injection of acriviolet the dye can be observed to ooze through the bowel wall.

Acquired post-operative adhesions are rarely found after a colectomy unless there has been leakage from the stoma. They are more frequently of infectious than traumatic origin. An abdomen which was found at primary operation for colectomy to be filled with adhesions has been observed to be entirely free from them in spite of having been opened seven times (Case 4931).

Chronic diffuse proliferative adenitis is a constant and valuable clinical sign of colonic leakage. It is often segmental in distribution, corresponding closely to the position of the intrinsic colon lesion. The glands usually contain living B. Coli and streptococci. Accidental gland section during the laparotomy may account occasionally for post-operative peritonitis.

Omental dysmorphism frequently causes partial obstruction and also axial

rotations of the colon. The bilateral symmetry of omental abnormalities is noteworthy. When the omentum is adherent in the right abdominal gutter it is likely to be adherent in the left. (Figs. 4 and 5.)

Partial intestinal obstruction is of two types. Barber [12] has demonstrated the effect of complete and incomplete mechanical occlusion in the ileo-colic region upon the neuromuscular control of the pylorus, and Satterlee [13] more recently has published clinical studies upon the causation of abnormal gastro-intestinal reflexes by rectal atresia. Since 1903, obstruction has been the subject of intensive and prolonged study on the part of the writer. Murphy,[14] Whipple,[15] Dragstedt,[16] recently and in great detail, Eisberg,[17] and finally Brown, Eustermann, Hartman and Rowntree [18] have continued this work. Andrew Todd McClintock [19] in 1917, noted another phase of the relationship between the terminal ileum and the duodenum. He says, "A sub-culture injected intravenously in rabbits caused intense hemorrhages of the duodenum, jejunum and appendix." It is extremely significant that McClintock's findings based upon the reaction to bacterial suspension coincided with those of Barber and Satterlee which resulted from clinical study.

FIG. 4.—Right omental deviant.

The source of the toxicosis accompanying duodenal obstruction is not yet definitely known, but the hypothesis advanced by the writer [20] in 1906, that a part of it at least is not of bacterial origin, but is elaborated by the duodenal epithelium, still remains to be disproven. Indeed the recent work of Miller and Raulson,[21] who consider epilepsy as a manifestation of anaphylaxis, appears to be somewhat in harmony with it. Some of the lethal product may arise from anaërobic bacteria, as suggested in the study of Draper's material by Torrey [22] who has demonstrated the presence of bacillus histolyticus. Whatever its source, it is probable that in every definite case of partial ileo-colic mechanical obstruction there is an associated and often unrecognized compensatory duodenal functional obstruction. This results in a complicating

endotoxemia from the duodenal epithelium which directly affects the brain. Hassin,[23] in his monograph on multiple sclerosis, considers it due to some unknown toxin, probably an endotoxin. In this connection attention is directed to the first paragraph of Ewing's report and also to Cotton's Van Uxem Lectures.[24]

Constipation is a frequent sequel of partial obstruction. It is primarily protective. A less frequent sequel, and one in which some of the worst evidences of colonic toxemia have been observed, is diarrhœa. This is often a

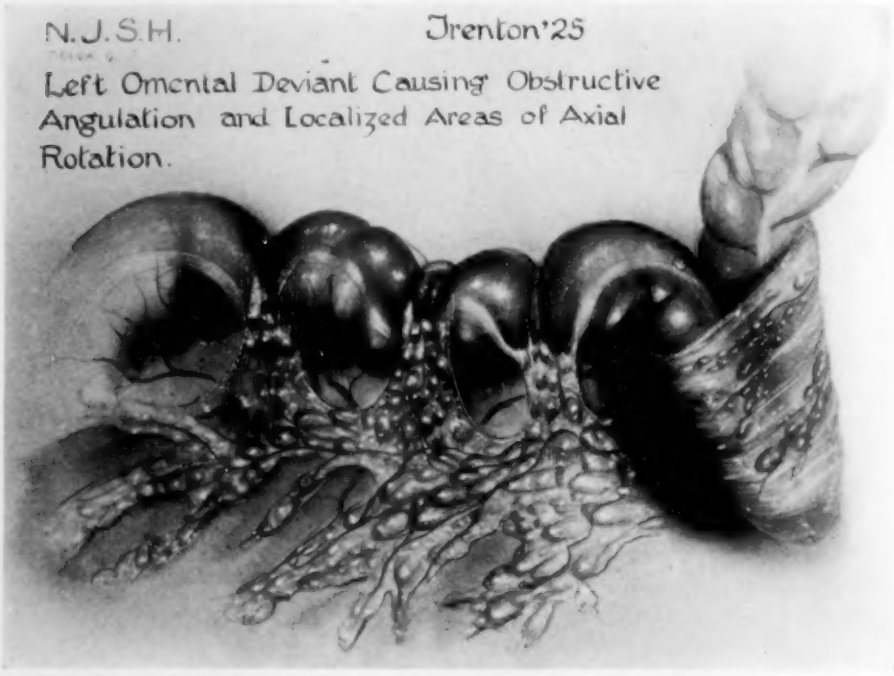

FIG. 5.—Typical congenital defect found at operation.

form of paradoxical incontinence, the bowel pouches remaining full of hard feces.

Short-circuiting.—Blake and Brown,[25] studying hemi-exclusion in laboratory animals, first demonstrated conclusively the impracticability of unilateral exclusion. Nevertheless such exclusions are still occasionally resorted to. Following ileo-sigmoidostomy the hemi-excluded colon becomes enormously distended, owing to the predominance of the anastaltic waves. Fig. 6 shows the pathological changes occurring in a loop created without option by the writer four years ago and recently removed. It was found to be filled with a fœtid red fluid containing a few solid particles and much hæmolyzed blood. For six months prior to the final resection the patient had averaged fifteen small stools daily, similar in character to the contents of the loop and presumably originating therefrom. Since excision the diarrhœa has ceased, and with it the so-called neurasthenia. The principle of short-circuiting is wrong because

it fails to take into consideration the invariable rule that the effluent will not pass through a lateral entero-anastomosis unless the normal path just aboral to it is blocked. The principle of hemi-exclusion is wrong in that it fails to overcome the effect of anastalsis.[28] Moreover, a leaking colon is left *in situ*.

Physiological Effects of Total Colectomy.—Thirst is almost always an immediate post-operative condition. It is not only painfully uncomfortable but seriously detrimental. It is due to the fact that practically all of the water absorbing surface has been removed. Hypodermoclyses of large quantities of one-half and even one-quarter strength salt solution have been used without ill effect or pain. It may be injurious to the kidneys to inject large amounts of sodium chloride. Immunity to toxic foods may occur. Colectomized patients sometimes state that they are not made sick by the accidental eating of tainted meat or other food which has poisoned others. Diarrhœa, amounting to from ten to fifteen watery movements daily, always gradually ceases in from two to three weeks as the terminal ileum takes on vicariously the water absorbing function of the excised colon. Increase in weight is to be expected after the water privation has ceased. The somewhat prevalent idea that patients are likely to have chronic diarrhœa and to lose weight is shown by a study of this series to be entirely erroneous.

FIG. 6.—Pathologic changes in loop of intestine excluded four years ago and recently removed.

Relationship of the Pathogenic Colon to Neuro-mental Symptoms.—From a study of this group of one hundred and sixty-four patients in whom colectomy either alone or combined with other forms of defocalization has been done the relief of symptoms in a fairly large percentage of the cases strongly indicates a connection between toxic factors and the functional psychoneuroses. This conclusion is based upon the striking disappearance of symptoms shortly after operation and their continued absence for a period of several years under competent field observation. Even allowing for the remissions for which the functional psycho-neuroses including epilepsy are notorious, and for the cases in which there has been little or no change, a group remains in which there has been either complete arrest or very marked

improvement. Two analogous groups comprising one thousand patients among the so-called functional psychotics were investigated at the State Hospital. One group of five hundred consecutive admissions between 1908 and 1911 was treated without detoxication. The other group of five hundred consecutive admissions between 1918 and 1920 was treated by detoxication. Of this latter group only eighty remained in the hospital at the end of five years (16 per cent.), while of the former group two hundred and fifty-six remained at the end of a similar period (51 per cent.). The recovery rate in the detoxicated group was 2.3 times that of the untreated group, the ratio being one hundred and forty to three hundred and twenty-eight. The mortality in the detoxicated group was 13 per cent., while in the untreated group it was 13.2 per cent.[27]

Finally, it seems probable that dysmorphisms of the colon and omentum are dominant, and that this in part explains the occasional hereditary transmission of certain nervous and mental disorders and their apparently spontaneous occurrence in high-grade families. The discovery and correction of such intestinal and omental anomalies in childhood, before the colon has been permanently damaged, is unquestionably the first and most important step in dealing with the problem. This is preventive surgery.[28]

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PRIMARY TUBERCULOSIS OF THE GALL-BLADDER

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and

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It is obvious that tuberculosis of the gall-bladder is a rare condition when a study of the literature reveals only fifteen reported cases. We think that it is worthy of note that this condition is not mentioned in that comprehensive work, Gallenwege Chirurgie, by H. Kehr, published in 1913. Nor have we been able to find any reference to this subject in the American literature for the past twenty-five years, with one exception, to which we refer below. Whether or not the gall-bladder represents the initial tuberculous lesion, or is a secondary point of attack, cannot be determined from the data at hand in most of these cases.

Simmonds[1] collected six cases from the German literature in 1908. He fails to note in his article whether or not these cases were thought to be primary tuberculosis of the gall-bladder, nor does he tell us what the authors considered to be the method or route by which the tubercle bacillus gained entry to that organ. He adds a case of his own of a boy, nine months old, dying of acute miliary tuberculosis, in which instance the gall-bladder was believed to be infected from the liver through the bile stream. The mucous membrane of the gall-bladder showed tuberculous ulcerations very similar to those appearing in the urinary bladder in tuberculous nephritis. Simmonds concluded from his own case and his study of the literature that there may be two types of tuberculous cholecystitis: First, a chronic ulcerous cholecystitis, with or without stones, apparently primary or associated with tuberculosis elsewhere in the body; second, an acute tuberculosis of the mucous membrane always secondary, brought by the bile stream from the biliary ducts of the liver, and always a part of a general acute miliary tuberculosis. He thinks the latter type far more frequent in acute miliary tuberculosis than is generally supposed and is unrecognized at autopsy. He mentions that this has been found several times but does not cite cases.

Lancereau[2] reports an autopsy in which he found a caseous mass replacing the gall-bladder in a woman thirty-two years old. Tuberculous granulations were found in the common duct; the spleen and mesenteric glands presented many tubercles and the right branch of the pubis was necrosed. He considers this to be a case of primary tuberculosis of the gall-bladder, the bacillus gaining entry through the ampulla of Vater and ascending along the common and cystic ducts. He states that the gall-bladder lesion is clearly the oldest pathologically of any he found and therefore the disease was primary in this organ. Lancereau distinguishes tuberculosis of the extra-hepatic biliary canals and gall-bladder from tuberculosis of Glisson's capsule and from disseminated tuberculosis of the liver. The first condition he thinks is always primary and its mode of entry from the intestine. This type bears no relation to age or sex. This author thinks that tuberculous cholecystitis should always be fairly easy to diagnose, but as he writes from the standpoint of the pathologist this conclusion is not of importance to the clinician. Failure to diagnose tuberculosis of the gall-bladder from other forms of chronic cholecystitis seems to us, in most instances, excusable.

In 1910, Galabrée[3] reported two cases of tuberculous cholecystitis, both of which were operated upon by Tédenat with one satisfactory recovery, and one death. Chole-

cystectomy was performed in both instances. In the first case the patient was a woman, thirty-three years old, who had had good health until four years before operation. During this time she noticed dull pains in the right hypochondrium with occasional knife-like pains in the same region and in the right flank. These pains were especially noticeable immediately after eating. Pain had been practically constant for eight months. Six months previous to operation she noticed a tumor at the right costal margin. She showed at the time of operation habitual malaise, emaciation and occasional vomiting, but no jaundice, and no cough. Temperature was 100.4 to 101.4; there was a harsh expiration at the left apex and a few dry râles on deep inspiration. Operation revealed a gall-bladder adherent to the hepatic flexure of the colon and to the pylorus. The adhesions showed granulations, grayish in color, with yellow points. The gall-bladder was hard, its walls greatly thickened and indented, and it was about the size of an adult hand. It contained black viscous matter and two large black stones. There were interstitial nodules the size of a grain of corn in its wall, which on gross section showed dry caseous foci of a puriform, yellowish, thickened substance. The specimen was not examined microscopically, "but, macroscopically there was no doubt as to the tuberculous character." The gall-bladder was removed and the abdomen drained. This patient made a good recovery, the wound healed without fistula, and the patient was dismissed on the thirty-fifth post-operative day. She was well and had no symptoms when seen six years later.

Galabrée's second case was a woman, thirty-nine years old, who had never been seriously ill until her present illness. One month prior to operation she lost appetite and strength rapidly and had continuous sharp pain in the right side, increased a few minutes after eating. An upper right side abdominal tumor was so large and extended so far posteriorly that she was operated upon by Tédenat with a diagnosis of kidney tumor. Posterior incision was made and a normal kidney was found. Upper right rectus incision was made and a tumor found extending from the liver to the right iliac fossa. This tumefied gall-bladder contained one perforating stone, 50 c.c. of pus, and grayish-yellow adhesions. The wall was one inch thick. It was removed and the abdomen drained at closure. The patient died on the third day. Autopsy was not permitted. Histologically the wall showed many tubercles and tubercle bacilli.

A. LATRONCHE[4] collected four more cases in 1911 and adds one of his own. All of these cases were in women between forty-one and forty-nine years of age. Four of them showed pain as a constant sign; four showed a definite tumor on examination; only one had jaundice, and vomiting was not a pronounced symptom in any. Two of these were treated by cholecystectomy (Braquehaye, Tédenat) of which one recovered (Braquehaye), and one died (Tédenat). Three cases were treated by cholecystostomy (Riedel, Czerny, Latronche) and all recovered, two with fistula and one without (Czerny). This latter was cauterized at operation with strong zinc chloride solution. Stones were found in all five cases. The gall-bladder was in every case found to be greatly thickened, and contained thick cheesy pus. In only two of these cases was a histological examination made (Braquehaye, Latronche). In only one, the author's, was an attempt made to show the relation of the gall-bladder to other tuberculous lesions. In his case there was a definite tuberculous peritonitis, and histological section showed tubercles in the wall of the gall-bladder extending from the serosa inward; from which he concludes that the bacillus was carried by the peritoneal lymphatics and by contiguity to the gall-bladder. Our case was as follows:

RANKIN. CASE NOW REPORTED.—July 12, 1921. Negress, thirty-eight years old, complains of pain and a mass in the right upper quadrant of the abdomen.

Past History.—Well as a child; pulmonary tuberculosis seven years ago. Took "the cure" for two years and thinks she made a complete recovery.

Present Illness.—Began about five years ago with persistent dull pain in the right hypochondrium. She had some food disturbance evidenced by increase of pain soon

after eating. At first the pain came on at night. For the past two years symptoms have greatly increased and the pain has occasionally radiated to the back on the right side. For past two weeks has been very sore over gall-bladder and has noticed a tumor. She has had some afternoon temperature, no loss of weight, no cough, expectoration, hæmoptysis or nightsweats.

Physical Examination.—Well-developed and nourished negress, thirty-eight years of age; does not look acutely or chronically ill; no anæmia; no jaundice of scleræ. Heart and lungs negative. Abdomen somewhat distended; muscles tightened. Mass in epigastrium and right hypochondrium which is fixed and very tender. Vaginal examination negative. Temperature 99, pulse 88, respiration 20. White blood-cells 5000; neutrophiles 70 per cent. Urine negative.

Diagnosis.—Perforated ulcer of the duodenum with abscess formation.

Operation by Dr. W. Barrow, July 13, 1921. Right rectus incision from costal margin to two inches below umbilicus. Large mass adherent to liver and small intestine. Adhesions separated with free oozing. Mass found to be gall-bladder, adherent to under-surface of liver with extension into liver. Gall-bladder opened, walls about three-quarters of an inch thick. Cavity contained caseous material but no stones. A portion of the wall was removed for diagnosis and rubber tube placed in the gall-bladder with three gauze strips next to the under surface. Layer closure.

The patient left the hospital after an uneventful convalescence. The wound healed without fistula.

Pathological Examination.—July 13, 1921. Macroscopic: The specimen consists of a small piece of tissue and caseous material removed from the gall-bladder. Microscopic: Sections from the gall-bladder show the wall to be greatly thickened due to an excess of hyaline connective tissue. It is densely infiltrated with lymphocytes and plasma cells. There are a number of areas of necrosis surrounded by endotheloid and lymphoid cells with a few giant cells. One surface shows a few cells that resemble liver cells. Sections from the caseous material show it to be a granular material with no formed elements.

Diagnosis.—Tuberculous cholecystitis.

August 20, 1925, this woman returned for observation. She went back to house work in September, 1921, and has progressed satisfactorily until June, 1925, when her abdomen began to swell. She notices now shortness of breath on exertion and palpitation. Feet and ankles swell at times. Physical examination: Heart and lungs negative. Abdomen: Scar over gall-bladder area, abdomen is prominent and contains fluid; shifting dulness most prominent below navel. Pelvic examination unsatisfactory, perineum and cervix O. K. Fundus and adnexa not felt. Impression Tuberculous peritonitis.

August 20, 1925: X-ray of chest for tuberculosis, negative.

August 24, 1925: Operation (Rankin). Upper right rectus incision through old scar. There was quite a lot of free fluid in the abdomen. The peritoneum, pelvis, broad ligaments and serosa of the bowel were studded with tubercles. The right upper abdomen contained densely adherent masses of viscera in the neighborhood of the gall-bladder and it was with difficulty that separation was made down to this organ. There was a small, thickened, nodular gall-bladder. All of the fluid was evacuated and the abdomen was closed without drainage.

Pathological Report.—Macroscopic examination: The specimen consists of a small piece of tissue from the peritoneum.

Microscopic Examination.—The sections show rather loose œdematous connective tissue with no evidence of acute inflammation.

September 4, 1925: Convalescence uneventful, all sutures out, wound healed by primary union. This patient was advised to consult her home doctor for paracentesis and to return for X-ray treatment.

December 4, 1925: Patient returns for X-ray treatment. She has had seven paracenteses since operation; was "tapped" four days ago, but abdomen is distended.

Treatment K. V. 190; M. A. 5. Distance 50 cm. Filter ½ cm. i al. Time 25 minutes. Area 25 x 25 cm. Location—anterior abdomen.

December 5, 1925: Same treatment.

January 18, 1926: Some nausea and vomiting after second half of previous treatment. General condition improved. Eating and sleeping better. Has been "tapped" once since last treatment. Treatment same.

January 25, 1926: Nausea and vomiting following treatment a week ago. Feeling O. K. now. Length of treatment reduced five minutes.

March 9, 1926: Patient had "flu" in February, in bed two weeks. Feeling fairly well again. Slight cough persists. Abdomen soft, little or no fluid. Was "tapped" a month ago and only a few ounces obtained.

March 9, 1926: Twenty-five minutes' treatment. March 11, 1926: Twenty minutes' treatment.

We do not think that laparotomy in August, 1925, was an important factor in the great improvement this patient has shown. We are rather inclined to the opinion that the X-ray treatments should be given the credit, though this method of treatment has only occasionally been of material benefit in tuberculous peritonitis. Of course, the case is too recent to form conclusions in regard to any therapeutic method.

This is too short a series, and the details in all but a few cases are too meagre to draw any satisfactory conclusions, but there are some similarities and differences in those cases in which we have more detailed accounts which warrant emphasis in a brief discussion. The rarity of a tuberculous lesion in the gall-bladder, even in acute general tuberculosis, may be due either to failure of the pathologist to recognize the condition, or to a special resistance of this organ to the tubercle bacillus. We are rather inclined to the latter opinion, because it has been shown by Hanot and Létienne [5] that the cystic bile of patients dying from tuberculosis failed to show tubercle bacilli in all but one case. And the work of Sergent [6] shows that tubercle bacilli flourish in the bile of guinea-pigs and dogs but do not produce lesions of the gall-bladder unless this organ has been injured, or the common duct has been injured or ligated. The presence of stones in eleven out of sixteen cases and chronic disease in four,* we believe a significant factor in lowering the gall-bladder resistance. There is no report to show the presence of tubercle bacilli in the stones themselves, and it is extremely doubtful that they can be the primary cause for lithiasis, which is assumed to be the case for the typhoid and colon bacilli at times. Is it possible that the fat-splitting and fat-soluble properties of the bile and pancreatic fluid are factors in this resistance, possibly attacking the waxy coat of the bacillus itself?

The mode of entry of the bacillus into the gall-bladder is in most cases purely a matter of conjecture. It may be brought by the blood from a distant focus by the hepatic artery or portal vein. If carried through the hepatic artery the bacillus may infect the gall-blaader directly, or secondarily through the liver, being brought to the gall-bladder in the bile after the hepatic biliary ducts have become involved. It may ascend from the intestine directly through the bile duct, though this is hard to understand in the case of a non-

* In Lancereau's case the gall-bladder was completely caseous, which made histological determination of its structure and type of inflammation impossible.

motile bacillus in a fluid flowing in the opposite direction, unless there is injury to the duct by existing inflammation. The gall-bladder may be the seat of tuberculosis secondary to the liver, which in turn has become infected from an active tuberculosis in the lower part of the right lung, the bacillus travelling through the diaphragm along the course of the lymphatics (Oberling [7]). The gall-bladder may become involved from a generalized tuberculous peritonitis by lymphatics of the peritoneum and by contiguity as in Latronche's case. In our case it seems reasonable to suppose that a gall-bladder already chronically diseased furnished a weakened site for a blood stream infection originating in the lung. The gall-bladder in this case appears to be almost certainly the primary abdominal focus of tuberculosis and for this reason the title, "Primary Tuberculosis of the Gall-bladder," has been chosen. In only five of the other cases in this series can be found stated an opinion in regard to the location of the primary focus. Galabrée [3] thinks the gall-bladder was primarily affected in both of his cases, and Lancereau [2] seems certain that this is true in his case. Latronche [4] and Simmonds [1] clearly show the condition to be secondary in their reports.

The symptoms in cases of tuberculous cholecystitis are mainly those present in any case of chronic disease of the gall-bladder, with or without stones, and therefore vary widely. The history of discomfort and pain may range between one month and fifteen years in duration. Pain is an almost invariable accompaniment, being absent but once in the cases reported. It may be sharp and agonizing in character, or dull and persistent; sometimes little more than a feeling of heaviness and discomfort after eating; it may be localized in the right hypochondrium or epigastrium or appear in the right lower quadrant of the abdomen, or even in the region of the right kidney. It is usually increased immediately after eating. Constipation is always present, usually extremely persistent, according to Latronche.[4] This symptom was absent in our observation. Vomiting is notably absent. The absence of jaundice, which was present in but one case, is not remarkable if we accept as correct Blahd's [8] estimation that it is present in but ten per cent. of all cases of disease of the gall-bladder and biliary tracts. The sex is in every instance female, and the age lies in the fourth and fifth decades, except in acute miliary tuberculosis. Loss of strength and appetite, emaciation, and cachexia are usually present, but mainly where the disease is far advanced elsewhere in the body.

The presence of a tender tumor has been noted in every case where details have been given. Latronche [4] says, "A tumor in the right hypochondrium, consisting of the hypertrophic gall-bladder, is found always during the course of tuberculosis cholecystitis." Fever may or may not be present. It was absent in several cases in this series.

The diagnosis had not been made before operation or autopsy except in the case reported by Lancereau.[2] Several times even at operation tuberculosis has not been considered. Riedel [9] reported his as sarcoma; Braquehaye and Latronche thought the condition was possibly carcinoma until the histological

examination was made. Other diagnoses have varied between cholelithiasis, the prevailing one, kidney tumor and ruptured duodenal ulcer. Obviously the true condition can be justly suspected only in cases with signs of general (miliary) or far advanced tuberculosis in other areas.

The specific post-operative complications may be a permanent fistula, tuberculous peritonitis, or both. Czerny [10] states that the persistence of a permanent fistula following operation for gall-bladder disease should lead one to suspect the presence of tuberculosis. In the six cases operated on in this series a fistula remained in two (Riedel, Latronche) of the four patients treated by cholecystostomy, and there was no fistula following cholecystectomy in the two cases which recovered (Braquehaye, Galabrée).

We think it is rather strange that tuberculous peritonitis has not been mentioned as a complication in any but the authors' case, except where this condition was, with the gall-bladder, a part of a generalized tuberculosis. When one considers the frequency with which this condition is associated with other active tuberculous lesions, both intra-abdominal and pulmonary, we would expect to find it appearing more often in our series. Holmes [11] reported a case in 1906 in which he operated for tuberculous peritonitis and distended gall-bladder. The gall-bladder and peritoneum showed no tubercles, but there was a large amount of free fluid in the abdomen. The ascites he attributed to pressure on the portal vein by the greatly distended gall-bladder. This case is not included in our series because histological examination showed no tubercles in the gall-bladder, though doubtless it shared in the condition of general tuberculosis found later to be present. Autopsy five weeks later showed diffuse miliary tuberculosis and tuberculous peritonitis. He thinks the operation stirred up the condition and the ascites facilitated its spread. Our case showed no peritonitis at the time of the first operation, but this appeared four years later.

The treatment of tuberculosis of the gall-bladder must of necessity be decided by the case. Acute miliary tuberculosis need not be considered. In conditions secondary to far-advanced active tuberculosis elsewhere, the surgical treatment of the gall-bladder should be palliative. In those cases where local and general conditions permit, we feel that a cholecystectomy should be done, but in saying this we are not unmindful of the figures in this short series, including our own case; namely, that of four cholecystostomies, there were four recoveries, two without fistula, while of four cholecystectomies done there were but two recoveries.

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RETROPERITONEAL TUBERCULOUS LYMPHADENITIS*

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One of the earliest cases in which tuberculous ileo-cæcal glands were found at operation and removed was reported in 1900 by the late Maurice Richardson of Boston before the American Surgical Association. The operation had been performed in 1895. At the same meeting, J. W. Elliott presented a similar case successfully operated on a year previous. At about the same time, Marchant [1] also described the condition. Since then this disease has been adequately discussed. A review of the literature, however, discloses only isolated reports of primary invasion of the retroperitoneal lymph-nodes. Although the primary retroperitoneal type of infection probably does not occur as frequently as the mesenteric type, it must occur with sufficient frequency to make it a definite entity.

Case Reports.—Case I.—J. L., age forty-three. Admitted to the surgical service of the University Hospital, March 7, 1923. Pre-operative diagnosis—retroperitoneal sarcoma.

Chief Complaint.—Pain and pulsation in the abdomen.

History of Present Illness.—Nine months ago the patient began to have a dull pain in the epigastrium and left hypochondrium. He could not eat very large meals without discomfort. He was distressed with considerable flatulence, belching and regurgitation. These were somewhat relieved by hot water and soda. He has vomited several times in the last nine months. Appetite has been poor and he has lost weight. Since January he has noticed a hardness in the upper abdomen.

Physical Examination.—B. P. 105/70. Rather poorly nourished male. Physical examination was negative except for a soft systolic murmur at the apex of the heart. On palpation of the abdomen there was a hard, nodular mass in the epigastrium extending to both the right and left of the midline. Rectal examination was negative.

Red blood cells, 4,280,000; white blood cells, 9600. *Wassermann*, negative.

Gastric X-ray.—Stomach, extragastric tumor to the left of the midline at the level with the greater curvature when lying down and widening out the duodenal loop. No direct connection with the stomach. Six-hour gastric residue. Tumor is probably pancreatic or retroperitoneal. Duodenum—negative for ulcer. Colon—good position. Transverse colon below mass and no connection, stasis even after daily movements.

Operation by Doctor Muller.—Gas-ether anæsthesia. Right rectus incision. Peritoneum opened. No masses visible. The liver was apparently normal. Spleen enlarged by one-third its size. Palpation disclosed a rather freely movable mass extending along the vertebral column and aorta and up under the lesser omental cavity. It pushed forward the mesentery of the duodenum. Conglomerate and discrete nodules were both present. One specimen from the base of the mesentery of the jejunum and one from the base of the mesentery of the transverse colon were removed for biopsy. Hæmostasis, wound closure, tier suture, no drainage.

Pathological Report.—Retroperitoneal tuberculous lymphadenitis. (Fig. 1.)

The patient made an uneventful recovery. During his convalescence he was treated

* Read before the Philadelphia Academy of Surgery, December, 1925.

with deep Röntgen therapy by Dr. Henry Pancoast. He was discharged on April 11 in excellent condition, having gained weight and the mass being much smaller in size.

At the present time he is entirely well, no abdominal mass can be palpated, he has gained considerably in weight and he is symptom-free.

CASE II.—H. M., age twenty-three. Admitted to the University Hospital, March 10, 1925. Chief complaint, pain in the abdomen.

History of Present Illness.—Patient has suffered with dull abdominal pain located in the epigastrium for several months. There has been no nausea or vomiting, fever or bowel disturbance. Yesterday, the pain became more acute and there was slight elevation of temperature. On examination by her family doctor a mass was felt in the upper abdomen to the left of the median line and she was referred to the hospital. Her family history is somewhat significant, the mother and father both having died of pulmonary tuberculosis.

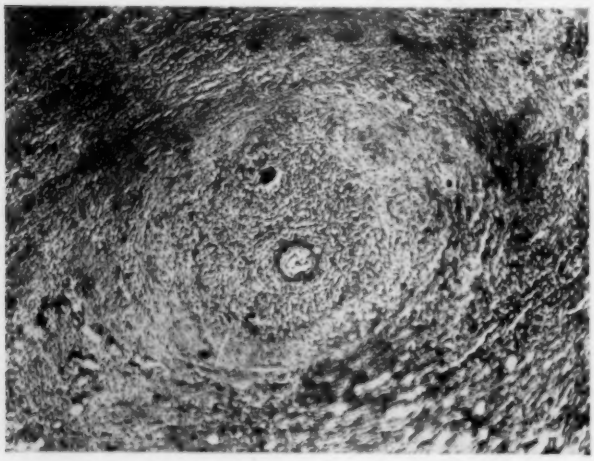

FIG. 1.—Microphotograph of specimen removed from Case I.

Physical Examination.—Temperature 99.2°, white blood cells 7800. Patient is an undernourished, anæmic looking young female who does not seem acutely ill. Physical examination is negative throughout, except for a mass in the upper abdomen in the region of the epigastrium, which is about 3 cm. in diameter. This mass is slightly tender to palpation. No other masses are palpable in the abdomen.

Operation by Doctor Ravdin.—Gas-ether anæsthesia. Left rectus incision. When the peritoneal cavity was opened a retroperitoneal mass was found which was large enough to have partly separated the base of the mesentery of the upper jejunum and the transverse colon. The mass was exposed. There was marked fluctuation and at one point the abscess appeared ready to perforate. With the exploring finger several ounces of pus were evacuated, the cavity swabbed out with iodine and one cigarette drain and one rubber tube inserted into the abscess cavity. The upper extremity of the mass was still hard and several enlarged glands extending along the aorta were palpable. A piece of the wall of the abscess was excised for biopsy. Hæmostasis, wound closure, tier suture, around drainage.

Pathological Report.—Chronic inflammatory tissue, probably tuberculous.

The patient made an uneventful operative recovery. Before discharge from the hospital she was treated with deep Röntgen therapy and has had a number of treatments since that time.

At the present time she is perfectly well, symptom-free and has gained nearly twenty pounds in weight.

Anatomical Considerations.—The explanation for the predominance of the mesenteric tuberculous lymph-gland is probably anatomical. In the majority of these cases the glands are found in the ileo-cæcal mesentery. It seems that anatomical and physiological conditions predestine the site of the infection. The lymphatics of the terminal ileum, cæcum and appendix form a system which seems separate and distinct from that of the remaining intestinal tract. They follow a course from right to left and upward, with the

ileo-cæcal region as a base, and empty into the receptaculum chyli opposite the second lumbar vertebra.

The apparent physiological reason for infection at this site as given by Corner [2] lies in the comparative stasis of the products of digestion in a mildly alkaline medium at this site; a condition which he thinks favors the passage of tubercle bacilli through the intact mucous membrane of the bowel. The microörganisms in the small bowel flourish and multiply during the pause of the fecal current in the cæcum. Thus there are three physiological reasons why the lymphatic glands in this region are most frequently infected: the delay in the passage of food, the presence of organisms possessing a maximum infectivity and the presence of inflammation.

In other portions of the small bowel the lymph drainage goes to the glands nearest to it, that is, the juxta-intestinal group and those situated around the primary branches of the superior mesenteric artery. These lie in the peritoneal folds of the mesentery. The juxta-intestinal group lie close to the intestinal insertion of the mesentery. These glands are small in size and are rarely affected. The second group, situated along the primary branches of the superior mesenteric artery and its first anastomotic arcade, is looked upon as the true regional glands of the jejunum and proximal ileum.

Another group of glands found on the posterior wall of the abdomen receives its afferents from a widely divergent area. The glands receive lymph partly direct, and partly through efferents from the glands in the peritoneal folds. A number of these posterior glands are found around the trunk of the superior mesenteric artery. These are not particularly associated with the small intestine, but receive lymphatics from a portion of the ascending colon, the hepatic flexure, the right half of the transverse colon, the duodenum and the stomach.

Origin of the Infection.—This latter group may become infected secondary to infection of the glands in the peritoneal folds, or by direct drainage from that portion of the gastro-intestinal tract which sends afferents to it, or, as occasionally occurs in cancer or sepsis, these distant glands may presumably become infected while glands nearer to the source of the infection remain apparently untouched. For some unexplained reason, in such cases the glands closer to the source of infection apparently are more resistant to the organisms even though they are closer to the site of septic invasion.

It is not necessary for the tubercle bacillus to cause a lesion in the intestinal mucosa previous to its entrance into the lymph-glands of the mesentery or retroperitoneal tissues. Upon this point most authors are agreed. Carson,[3] however, believes that the infection occurs through some breach in the intestinal mucous membrane, and that before the bacillus can gain a foothold in the glands some preëxisting influence such as sepsis must have lowered the resisting power of the gland.

Frequency.—That the condition is much more frequent than is generally believed can be shown from the autopsy findings in any large hospital, where

both the active and healed lesion can be frequently demonstrated. Risely,[4] in a report of 30 cases operated on at the Massachusetts General Hospital for some more or less acute abdominal condition, and in which definite mesenteric or retroperitoneal nodes were found at operation, found that in three instances the glands were entirely retroperitoneal. The explanation of the apparent rarity of the disease as evidenced from case reports, lies in the fact that unless the invasion becomes widespread or unless complications ensue, the symptoms of the disease are so elusive and point so indefinitely to any particular region that they are disregarded and no accurate diagnosis is made.

Course of the Disease.—The cases here reported present two stages of the disease in which a clinical diagnosis might be made. The first case illustrates an earlier stage of the process. It represents probably the earliest period at which the surgeon would see the patient. In this case simple inflammatory changes were evident in the periphery of the mass with the appearance of hyperplasia of the lymphoid tissue. The connective tissue had increased markedly, the reticular tissue being dense and fibrous. The trabeculæ and capsule were thickened. The tubercles themselves instead of rapidly undergoing caseous degeneration had become partly fibrous and the hyperplastic inflammatory reaction at the periphery of the nodes had resulted in the formation of a dense, conglomerate, nodular mass.

The second case represents a more advanced stage of the disease, or at least one in which fibrosis and hyalinization did not occur to an extent sufficient to limit caseous degeneration. It is in this type of case that the peritoneum is more apt to become involved. Caseation, with possible secondary infection and suppuration, in this patient had spread so as to involve nearly the entire mass, only parts of the periphery still remaining somewhat firm. In mesenteric lymphadenitis suppuration is rarely observed and there is no reason to suppose that it should be any more frequent in the retroperitoneal type.

In the third stage of the disease calcification presumably occurs in a manner similar to that which takes place in the mesenteric glands. It is probable that the calcified retroperitoneal nodes observed by the röntgenologist represent this stage of the disease. It is unlikely, however, that large retroperitoneal masses, the result of widespread lymph-gland disease, ever undergo calcification.

Age Incidence.—It is interesting to note that while tuberculous mesenteric lymphadenitis is more usually a disease of childhood, both of these cases occurred in adults. The cases of Tyrode,[5] and Lynch[6] also occurred in individuals past twenty years of age. It may be that in the adult the regional glands have undergone sufficient fibrosis from repeated septic infection to render them resistive and that the organisms travel further along the lymph passages to reach fertile soil.

Symptoms and Diagnosis.—Unfortunately, the diagnosis of this disease is very difficult and in many cases practically impossible, as it apparently follows no definite symptom complex. In 65 cases in which one or more

retroperitoneal or mesenteric healed or active tuberculous glands were found at autopsy at the Massachusetts General Hospital,[4] the clinical record was reviewed, especially from the point of view of the past history, previous health, and attacks of abdominal pain. None of these 65 cases had anything in its past history to suggest the disease. Thus, at least early in the disease no symptoms referable to the condition may be present.

The patients which are here reported had sufficiently large masses to be palpable. They were undernourished and appeared subnormal as to strength and endurance. They were anæmic and listless. One had a bad heritage for tuberculosis, but in neither was any other tuberculous lesion demonstrable. The appetite was poor. Constipation was not a major symptom, but both complained of flatulence. The chief complaint in both instances was pain, dull and lasting, confined to the upper abdomen, but not pointing definitely to any abdominal organ. The pain was diffuse and from the anatomical distribution of the disease in these cases it might have been due to encroachment on the solar plexus.

It would seem nearly hopeless therefore to diagnose the condition before operation, and even then in those cases in which caseation has not occurred the true diagnosis without biopsy may be overlooked. This is especially so since in the cases of primary infection of the retroperitoneal glands mesenteric enlargement is not to be found. It is cases of this type which this paper considers. Undoubtedly, many of these patients are diagnosed as having retroperitoneal lympho-sarcoma. It is therefore advisable wherever possible to remove some tissue for examination, for only microscopic examination of the excised tissue will reveal the benign and curable nature of the disease.

Treatment.—Both of these cases have done well under good hygiene and X-ray treatment. It is likely that in the early stages good hygiene alone will cause subsidence and cure. In all cases it is important to increase the normal vital resisting forces of the body. Removal of the nodes in those cases where this is feasible should be done, but it is unwise to subject the patient to the risk entailed when the blood supply to the viscera is liable to be compromised.

It is important to do a biopsy in any case where doubt exists since the X-ray treatment for retroperitoneal sarcoma is different from that of retroperitoneal tuberculosis. In the first instance the dosage is intensive, while in the latter it is mild, and intensive X-ray treatment in the cases of retroperitoneal tuberculosis will not give favorable results.

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MESENTERIC LYMPHADENITIS*

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In 1920, one of us (Wilensky) [9] called attention to a group of cases in which an acute inflammatory process found its main seat of development in the mesenteric glands grouped in the angle of junction of the ileum and ascending colon. Attention was called to this syndrome in view of the comparative frequency with which it occurred, in view of the equal frequency with which the condition was confounded with attacks of acute inflammation in the appendix, and with the frequency with which these adenopathies were subjected to unnecessary operation because of the mistaken diagnosis of acute appendicitis.

The present communication is an elaboration of this thesis and is based upon a more abundant experience obtained since then. In the intervening time a number of communications have appeared bearing directly on this subject, but no thorough study has been so far reported.

The literature is curiously spare of references to simple mesenteric lymphadenitis. Most [1,2,3,4,5,6,7] of the papers on this subject consider only the tuberculous variety or assume that all of the cases are superimposed on the basis of a tuberculous infection. The more important papers follow.

1. Struthers,[10] in 1921, reported four cases three of which were of the tuberculous variety. His records show that he came upon twenty-two cases of mesenteric lymphadenitis in a period of two years during which time he treated one hundred and eighty-seven cases of appendicitis. He believes that the adenitis is due to a tuberculous infection or to a mixed infection on the basis of an old tuberculosis. He also calls attention to the curious but important fact that in appendicitis we do not find a regional adenitis. He believes that tuberculosis of the mesenteric glands is quite common in the young, that the glands retrogress later, and that only when a mixed infection is superimposed do we get the acute attacks of lymphadenitis.

2. Heusser,[8] however, in 1923, brought out the fact that there was no definite basis for considering some of these cases tuberculous. He examined the excised inflamed glands bacteriologically and pathologically and failed to obtain evidence of tuberculosis by culture, guinea pig injection or by the aid of the antiformin method. Neither could he demonstrate bacteriologically the presence of any other organisms. He gives a résumé of the clinical findings based on an experience of forty cases, of which twenty-nine were in patients younger than fifteen years. Heusser speculates concerning the possible rôle of intestinal parasites in the etiology of the syndrome.

3. Wilensky,[9] in 1920, described three cases illustrating different types or stages of mesenteric lymphadenitis, and pointed out that some cases of intra-abdominal abscess, formerly ascribed to the appendix, may in reality have resulted from the breaking down

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of the mesenteric nodes, particularly when a fecal discharge had never been noted in the course of subsequent healing of the operative wound.

4. WAGNER [13] (1925) reported a case in which the lymphadenitis had a definite traumatic origin, a blow over the cæcum producing a typhlitis with subsequent local adenitis.

5. SYMMERS [15] (1924) points out that Hodgkins disease produces a type of mesenteric lymphadenitis which can be confused with the simple and the tuberculous varieties.

6. WALKER [14] (1922) brings out the importance of keeping in mind the possibility of calcification in the mesenteric nodes which röntgenographically have been misinterpreted as ureteral calculi. This phase of the subject will be discussed in a later paragraph.

Anatomy.—The general structure of the lymphatic apparatus of the small intestine is comparatively simple and is dependent upon the villus structure of the intestinal mucous membrane. The beginnings of the lymphatic collecting system are found in the blind lacteal vessels which occupy the centre of the villus and which are surrounded by the intravillus venous capillary plexus. Absorption into these primary vessels occurs from the intercellular lymphatic spaces. The primary lacteals unite with one another to form a plexus of vessels which lie in the walls of the intestine.

In addition to this network of lymphatic vessels, the wall of the small intestine is studded with masses of lymphadenoid tissue. In the submucosa of the wall of the terminal ileum, these masses of lymphadenoid tissue assume such large proportions as to be easily recognizable to the naked eye. These form the Peyer's patches of the intestine. The primary lacteals of the intestinal villi and the first succession of the lymphatic network in the intestinal wall both have intimate relationships with these collections of lymphadenoid tissue, which function similarly to discrete lymph-nodes and which are interpolated in the total lymphatic network as the first point of blockage and filtration for the lymphatic flow. The efferent vessels of these collections of lymphadenoid tissue mingle in the primary lymphatic network of the intestinal wall and the resulting accumulated network forms larger trunks which penetrate the walls of the intestine usually in the immediate vicinity of the intestinal veins in the mesenteric border of the gut and thereafter form a vast interconnecting network of larger and larger lymphatic vessels which lie between the opposing layers of the small intestinal mesentery.

Groups of lymphatic glands are situated between the layers of the mesentery and occupy the meshes formed by the profuse anastomoses of the branches of the superior mesenteric artery as they divide and subdivide to supply the small intestine. Collectively the nodes are commonly called the mesenteric glands. They vary in size from a pea to that of a small almond and are proportionately distributed around the periphery of the mesentery with the exception of the immediate neighborhood of the ileum and ileocolic junction in which location the bulk of the glands lie. According to various anatomists the glands vary in number from forty or fifty to one hundred or one hundred and fifty.

The mesenteric lymph-nodes are interpolated in the course of the lymphatic network situated between the leaves of the small intestinal mesentery and form the second point of filtration and blockage in the course of the lymphatic

flow. The anatomical relationships between the collections of lymphadenoid tissue in the walls of the terminal ileum and the group of mesenteric glands in the ileocolic angle is especially marked; numerically the two sets are in direct proportion to one another.

The direction of flow of the lymphatic current is away from the intestinal wall and its contained Peyer's patches inwards to the mesenteric glands and along the subsequent plexus towards the root of the mesentery and into the thoracic duct. This makes up by far the major portion of the flow. In very recent years paths of flow have been demonstrated as running from the appendicular region in the retroperitoneal spaces behind the ascending colon towards the gastroduodenal junction and the liver. Some of these are undoubtedly derived from communicating lymphatic vessels which make connections between the lymphatic spaces of the mesentery and those of the retroperitoneal retrocolonic space. The flow in the latter forms a minority in the total lymphatic circulation. In this communication only the first of these paths of flow receives attention.

Clinical Notes.—Mesenteric lymphadenitis is a syndrome which has in recent years established itself as a definite clinical entity. Cases are not infrequently met in which an inflammatory lesion is centred in the lymph-nodes of the mesentery in the general region of the ileocolic junction. The clinical picture of the illness is very similar to that of other acute conditions in the lower right abdominal quadrant; and since our attention was attracted to this syndrome we have come to the opinion that mesenteric lymphadenitis is a clinical picture which is not as rare as has heretofore been supposed and we believe that with increased experience and with a wider spread of the knowledge of this symptom complex, this condition will seemingly increase in frequency.

The chief characteristics of the clinical picture are as follows:

The patients are usually children or young adults. The most striking symptom is abdominal pain often beginning in the umbilical region, then shifting to the right lower quadrant. There may be nausea, but this need not necessarily be accompanied by vomiting. The temperature and pulse rate are elevated. A leucocytosis is present. A history of earlier attacks of cervical lymphadenitis can sometimes be obtained.

The cases which we have observed can be divided into four clinical groups which we have called for convenience:

Group I. Simple mesenteric lymphadenitis.

Group II. Suppurative mesenteric lymphadenitis.

Group III. Tuberculous mesenteric lymphadenitis.

Group IV. Terminal stage of mesenteric lymphadenitis.

Group I. Simple Mesenteric Lymphadenitis.—In the cases in which the gross pathological picture includes a uniform discrete enlargement of the mesenteric glands without any evidence of suppuration, the affection has an acute onset with chill, or chilliness, and fever ranging to 102 or 103° F.; with generalized abdominal pains rapidly becoming localized in the right iliac

fossa; and with moderate symptoms of intestinal disturbance. The degree of toxæmia is often out of proportion to the mildness of the abdominal signs.

Examination of the abdomen usually presents localized tenderness in the right lower quadrant, but little or no rigidity. There may be tonsillar hypertrophy but this does not occur in every case. Examination is otherwise negative.

The character of the physical findings is such as frequently accompanies an early or advanced form of appendiceal inflammation. The clinical picture

FIG. 1.—Microphotograph of a section of a gland removed from the mesentery in a case of simple mesenteric lymphadenitis. Note the dilated lymph spaces.

is so similar to that of acute appendicitis that invariably that assumption has been previously made and operation has been advised under that clinical impression. With increasing knowledge, it has latterly happened upon several occasions that we have entertained suspicions that a lymphadenitis was present. Owing to the nature of things, however, an acute appendicitis could not always be excluded, and with very few exceptions exploration of the abdominal cavity was done as the safer procedure.

With the abdomen open, the appendix is found to be normal. Thorough exploration of the abdominal cavity shows no pathological changes, excepting that the mesenteric lymph-nodes draining the lower ileum, the appendix and the cæcum are enlarged and inflamed. There is no free fluid in the early stages. Under the circumstances the appendix is removed and depending upon all factors a gland is sometimes excised for pathologic examination. In

the non-suppurative type of case, the abdominal cavity can be, and always is closed without any drainage of any kind.

The pathology of the glands which have been excised and have been submitted to anatomical diagnosis has always been that of a simple hyperplasia. On one occasion the report read, "Circulatory changes." A microphotograph of one of the sectioned glands is appended. (Fig. 1.)

Following the laparotomy the subjective and objective symptoms disappear fairly promptly and an uneventful convalescence follows. Cases one to four illustrate this simple type of abdominal lymphadenitis.

Case I.—A boy of eleven had an attack of nausea sixteen hours before admission to the hospital. A few hours later, a sharp pain was noted located in the abdomen to the right of the umbilicus. He then began to vomit. The bowels moved after catharsis. The patient had had two similar attacks four and twelve months previously. A tonsillectomy had been performed at the age of two and one-half years. He had had measles. At the time of admission to the hospital, the temperature was 102 and the pulse rate was 112. The physical examination showed an hypertrophied remnant of the left tonsil. The tongue was coated. There was exquisite tenderness and rebound tenderness in the right lower quadrant with rigidity of the overlying abdominal wall. No mass was palpable. Examination was otherwise negative. The blood count showed 14,200 white blood cells with a differential count of 86 per cent. polymorphonuclears.

Operation was performed with the diagnosis of acute appendicitis (Doctor Colp). Exploration revealed a normal appendix. There was a moderate amount of clear fluid in the peritoneal cavity. The glands of the mesentery were found to be enlarged to two or three times the normal size, measuring one to three centimetres in diameter, and were soft and pink in color. The appendix and one of the glands were removed, and the abdomen was closed without drainage.

The appendix showed "chronic inflammatory changes;" the gland showed "circulatory changes." The culture of the fluid from the abdomen showed an atypical Gram-negative bacillus and the smear was bacteriologically negative.

The post-operative course was uneventful, the temperature became normal on the sixth day and the boy left the hospital on the tenth day.

Case II.—A boy of fifteen was awakened during the night by generalized abdominal pain. He was nauseated but did not vomit. After two days the pain localized in the right lower quadrant. After three more days the pain disappeared. The next night the pain reappeared and the boy was brought to the hospital.

The patient did not appear acutely ill. The temperature and pulse rate were normal. There was no general lymphadenopathy. The abdomen showed only a slight rebound tenderness in the right lower quadrant. Otherwise examination was negative. The pre-operative diagnosis was "subsiding appendicitis."

Operation (Hahn) revealed a normal appendix. A thorough exploration of the abdominal cavity showed only several small inflamed lymph-nodes in the mesentery of the terminal ileum. The appendix and one of the nodes were excised.

The pathologic examination showed "chronic inflammation of the appendix," and "circulatory changes" in the lymph-nodes.

Convalescence was uninterrupted and the patient was discharged from the hospital on the thirteenth day.

Case III.—Following a romp at the seashore a girl of thirteen developed a chill and vomited. Generalized abdominal pains set in and persisted during the preceding night and during the following morning; the vomiting continued. A previous attack of abdominal pain three years before had been diagnosed as appendicitis. She had had scarlet fever, mumps and bronchitis. A tuberculosis of the cervical lymph-glands had been operated

upon three times, but at the time of admission to the hospital, the neck wounds were all healed.

On admission she appeared to be acutely ill. She complained of abdominal pain. There was a peculiar yellowish tinge to the skin but no bile was found in the urine. The tonsils were slightly congested and the crypts contained purulent material. The examination of the chest showed no abnormality. There was diffuse abdominal tenderness which was more marked on the right side near the umbilical level. There was no rigidity of the abdominal muscles, and no mass could be palpated. The white blood count was 17,500 with a differential count of 83 per cent. polymorphonuclears. It was deemed safer not to defer operation as the presence of an acute appendicitis was thought to be probable, although not certain. The degree of toxæmia and the lack of abdominal signs spoke against appendicitis, but the abdominal pain, vomiting, fever and tenderness urged upon one the necessity for exploration.

Operation (Hahn) revealed a normal appendix. The mesentery contained numerous inflamed lymph-glands one of which was the size of a bean. There was no fluid in the abdominal cavity. The spleen was not enlarged. The other abdominal organs were explored and found normal. The post-operative course was uneventful and the patient went home on the eighth day. The Von Pirquet and Mantoux tests were negative.

Case IV.—A ten year old boy had been having abdominal symptoms for two days prior to his admission to the hospital. The illness began suddenly with generalized abdominal cramps which had a tendency to radiate towards the right iliac fossa; in that locality the pain localized after several hours. A dose of castor oil resulted in numerous bowel evacuations, but there was no blood, mucus or other abnormal content in the stools. There was no vomiting at any time. After a while the pain seemed slightly relieved, but, shortly, it returned again with increased severity. There was some chilliness at the onset and at the time of admission to the hospital the temperature had risen to 102° F.

The boy's abdomen was moderately distended. There was some spasm over the right rectus muscle over its lower half but no real rigidity; and at McBurney's point there was moderately well marked tenderness to pressure. No mass was palpable. The physical examination of the rest of the boy's body showed no abnormal findings with the exception of an hypertrophied condition of both tonsils.

With the diagnosis of an acute appendicitis the abdomen was immediately opened (Wilensky). The appendix showed no macroscopic change. The terminal ileum and caput coli and ascending colon were also normal. The lymph-nodes in the mesentery—the mesenteric glands—draining this part of the alimentary canal, were, however enlarged and varied in size from one-fourth to three-fourths of an inch in their largest diameters. The glands were discrete; there was no periadenitis; and none of the glands showed any foci of liquefaction. One of the glands was excised for microscopic examination and the appendix was removed in the usual manner by ligature, ablation and cauterization of the stump with carbolic acid. The abdominal wound was thereafter closed without any intra-abdominal drainage.

On the day after operation the temperature dropped to normal and all symptoms gradually disappeared thereafter. The subsequent convalescence was uneventful.

Group II. Suppurative Mesenteric Lymphadenitis.—In other cases of mesenteric lymphadenitis the process has advanced further, more extensive pathological changes are found in the nodes, and suppuration occurs. The clinical picture is very similar to that of the cases in the first group, the difference, if any exists, being one of degree of intensity of the manifestations, and being due to the progression of the illness. The tumefaction is very commonly palpable through the abdominal wall and resembles in all particulars an appendicular abscess. It is impossible to make the differentiation clinically, and under the circumstances an operation is undertaken with the latter diagno-

sis in mind. It makes little difference practically as operation is necessary under either condition.

The differentiation is, of course, made immediately after opening the abdomen when a normal appendix is exposed to view. A little excess of intraperitoneal fluid is usually present. The physical appearances of the intra-abdominal pathology indicate immediately that suppuration has occurred. The mesenteric glands are matted together into a larger or smaller mass in the midst of which the focus of liquefaction is found. Coils of small intestine may surround and be adherent to the underlying glandular swelling, or the latter may be buried under the adherent mesentery and posterior peritoneum and the overlying intestinal coils may be free. No tubercle formation, or evidence of any other extraordinary etiological cause is demonstrable to the naked eye.

The laboratory data indicate that pathologically and bacteriologically this type of adenitis is the ordinary pyogenic process and that it is not caused by tubercle bacilli or other extraordinary type of infecting organism.

The post-operative course has been stormy in our cases of suppurative mesenteric lymphadenitis. Complications are common. The most common is intestinal obstruction due to adhesions, bands, and resulting compressions and angulations of the intestinal coils. So far none of our own cases has died.

Cases V and VI illustrate the suppurative type of mesenteric lymphadenitis.

Case V.—A young undernourished boy became suddenly ill and the clinical picture resembled very closely that of the preceding patients and had all the ear marks of an attack of acute appendicitis. The symptoms were quite well marked; the fever was high; the patient looked sick; and, in addition to the local abdominal phenomena of spasm, tenderness and distention, an intra-abdominal mass was palpable in the lower abdomen lying partly in the right iliac fossa, and partly extending across the median line to the left. There were no other subjective or objective findings in any other part of the body which might lead one to suspect that the causative lesion was present elsewhere than in the right iliac fossa. The duration of the illness, which was almost a week, and the presence of a mass prompted the assumption that the pathological picture included an inflamed appendix either buried and surrounded in omental adhesions, or surrounded and lying in the wall of an abscess; with this assumption the patient was operated upon immediately (Wilensky). On opening the abdomen the mass was seen to be buried in and under the mesentery and the loops of intestine surrounding this area were everywhere non-adherent and distinct from one another. A rapid survey showed that these as well as the appendix were normal in every way. As a preliminary measure the appendix was removed. A further examination of the mass showed that it consisted of a number of lymph-nodes which had become matted together and had broken down and the presence of pus was demonstrated when during the manipulations the abscess was ruptured into. It was not possible, nor did it seem advisable to do anything more radical than to institute proper drainage. Accordingly this was done and the abdominal wound was sutured with the exception of the angle through which the drainage apparatus emerged.

The post-operative course was stormy. The temperature persisted for several weeks before it came down to normal levels. The subsequent course of affairs was marked by an attack of acute intestinal obstruction which made its appearance before the abdominal wound had completely healed and for which operation became necessary. The obstruction was due to a broad adhesion in the neighborhood of the old wound and sinus which had produced a sharp angulation of the small intestine. Owing to the precarious condition of the child nothing radical could be done and one had to content oneself with establishing a fecal fistula as close to the point of obstruction as was possible.

The fecal fistula acted most efficiently in relieving the obstruction, and fecal matter continued to discharge from the wound for a number of months. Finally the fistula had to be closed by operation (Wilensky) during which the loop of intestine was freed from its attachments and the opening was closed and inverted in the usual way. This was followed by prompt healing and soon thereafter the patient was discharged from the hospital cured.

Case VI.—A boy of six was seized with an attack of pain in the umbilical region and developed a temperature of 104° F. For the next ten days the latter varied between 99° and 101° F. without any chills. The pain then disappeared. There was no vomiting or diarrhœa. The child had suffered from recurring febrile attacks, characterized by nausea, vomiting and cardiac palpitation which occurred every three or four months and which lasted several days each time. These attacks had been diagnosed "acidosis." No attack of this kind occurred during the past year. A purulent otitis media and a suppurative cervical adenitis had occurred one year previously; tonsillectomy was performed about this time.

On admission to the hospital the patient appeared to be acutely ill. The face was flushed. The tongue was coated. The teeth were in poor condition and the pharynx was slightly congested. There was rigidity of the lower half of the right rectus muscle with direct localized tenderness in the general region of McBurney's point. The rectal examination showed slight tenderness and fulness in the cul-de-sac on the right side. Otherwise the physical examination was negative. A diagnosis of appendicular abscess was made.

Laparotomy (Doctor Colp) revealed a hard firm mass to the mesial side of the cæcum and ascending colon. The mass was covered by omentum and by adherent intestine and contained a thick greenish-yellow odorless pus. The appendix was apparently normal. An appendicectomy was performed. The abscess was drained.

The post-operative course was very stormy. The peritonitis which developed was finally overcome and a residual abscess formed which was evacuated (Hahn) through the original wound. A right upper lobe pneumonia was an additional complication during the fifth week.

The temperature ranged up to 105° F. on the sixth day and did not reach a normal level until the twenty-fourth day. It rose again during the course of the pneumonia during during the fifth week and did not reach its final normal level until the eleventh week. Pirquet tests were negative. The pathological examination of the appendix showed inflammation of only the serous coat. This is explainable by the propinquity of the appendix to the mesenteric abscess. The pus from the abdominal abscess contained hæmolytic streptococcus.

The abscess here was probably due to a mass of mesenteric glands which had broken down and suppurated. The secondary abscesses may have been residual in nature, or may have been repetitions or continuations of the original process in other neighboring glands.

Group III. Tuberculous Mesenteric Lymphadenitis.—This group includes the cases in which the adenitis is of tuberculous origin. The clinical picture resembles that of the cases in Group II. The physical findings exposed on the operating table need not necessarily include any macroscopic evidence of the tuberculous infection either in the lymph-nodes or in other intra-abdominal viscera and the diagnosis of the latter condition may become apparent at a later date or may be made upon histological examination of tissue excised during the operation. The post-operative course is stormy as in the cases of pyogenic mesenteric lymphadenitis and complications occur. An important complication with tuberculous infection is the tendency for fecal fistula to form and to eventuate in persistent fistulæ which require secondary operations

for closure. During such secondary operations, typical tuberculous lesions can be demonstrated. The notes of Case VII illustrate this type of case.

Case VII.—This was a young girl of sixteen years who, similarly to the previous patients, was admitted to the hospital with the diagnosis of acute appendicitis. The history was quite the orthodox one for such an illness and included an acute onset with generalized abdominal pain associated with vomiting and constipation, followed by a fairly rapid subsidence of the general symptoms concomitantly with the localization and intensification of the symptoms—pain, rigidity, and tenderness in the right iliac fossa. There was nothing in the family or previous history to cause one to suspect any unusual etiology: the patient had never been ill before. The general physical examination disclosed no abnormal findings. Locally a small mass was palpable which was interpreted as being a much thickened appendix with or without a small accumulation of pus.

Operation (Wilensky) was done immediately. On opening the abdomen, it was found that the small mass was a group of inflamed glands, buried in the mesentery near the ileocæcal junction; these were matted together and contained a soft area; the appendix, although it lay very near, was not involved in the process. Nowhere else in the belly could any other lesion be demonstrated and in the immediate neighborhood there was no indication of a spread of the pathological process either from or to the intestinal tract. The appendix was removed. An attempt was also made to enucleate the glands; this was only partly successful and during the manipulations the abscess was ruptured and a small quantity of yellowish pus discharged. A drain was inserted and the abdominal wound was partially closed.

A fecal fistula appeared in the second week; it was rather profuse and continued for more than four months in an unchanged condition. The sutured part of the abdominal wound having become infected during the operation, parted later and thereafter the healing proceeded slowly for a number of months until nothing was left but an extremely narrow fistula showing no tendency to close completely; exhausted patience prompted the secondary operation. The cause of the failure to heal as well as of the fecal fistula was known to us from the examination of the lymph-node which had been excised at the primary operation.

At the secondary exploration the nature of the disease was confirmed as being a tuberculosis of the hypertrophic variety and was located mostly in the caput and ascending colon and to a slight extent in the ileum. The sinus led down to a small opening in the bowel. The intestinal wall was thickened without, however, having any tubercles visible on its surface; but the general appearance of the gross pathology indicated the tuberculous nature of the infection, even if we had had no previous evidence in the microscopical examination of the lymph-node. No other lesions being demonstrable in the adjoining coils of gut, the involved ileocæcal junction was excised and the continuity of the gut was reëstablished by a side-to-side suture anastomosis. The abdominal wound was closed entirely without any drainage.

The convalescence was most uneventful and at the end of the second week the patient left the hospital cured.

In the excised specimen the bulk of the lesion lay on the mucosa side. Here there were a number of large and small ulcerations with overhanging edges and showing tendencies to assume vertical directions. There was no stenosis of the lumen even at the ileocæcal valve.

Group IV. Terminal Stage of Mesenteric Lymphadenitis.—This group includes cases in which the pathology is that of a terminal lesion. The symptom complex and the physical findings obtained by examination of the patient are similar in many ways to those of the cases in the previous groups. The pathology—that of a calcified lymph-gland—probably has no relation to the

immediate symptoms presented by the patient. The operative findings otherwise approach those of the cases in Group I. The post-operative course is also similar to that of the cases in Group I. The notes of Case VIII illustrate this type of case.

CASE VIII.—A young lady of sixteen was brought in to the hospital with the history of having had abdominal pain and of having vomited. The pain was localized to the right lower quadrant. The physical findings were reported to have been tenderness, rigidity and rebound tenderness in the right lower quadrant with tenderness high up on the right rectal wall; but, owing to the unfortunate administration of a dose of morphine before these reported findings could be confirmed, the character of the latter could not be properly evaluated, and under the circumstances exploration was deemed advisable.

Exploration (Hahn) showed that the appendix was covered by a veil of adhesions, but otherwise the organ did not appear to be inflamed. In the mesentery of the lower ileum was a mass the size of an almond, firm and white and evidently a calcified lymph-node. Several similar smaller nodes were felt. Further exploration showed no abnormality in the abdominal cavity. The appendix was removed. Convalescence was uneventful and the patient was discharged from the hospital on the twelfth day.

The pathological examination showed no inflammatory changes in the appendix. Röntgenological studies which were subsequently made showed "on the right side of the abdomen on a level between the third and fourth lumbar vertebræ an irregular dense concretion outside the usual course of the ureter at this point. It is also not of the usual shape of a ureteral calculus." (Doctor Jaches.)

Discussion.—There can be no doubt that the relationship between the cases described in Groups I and II are very intimate; in fact they are surely but different stages of one and the same pyogenic process; but whereas in the first group the process is so benign that resolution occurs and spontaneous cure follows, in the second type the more virulent infection leads to a more advanced pathological process in which suppuration occurs and operation becomes necessary.

Large intraperitoneal abscesses of unknown origin and etiology are encountered from time to time which are located in the lower right quadrant of the abdominal cavity; the primary lesion is not susceptible of demonstration at operation for the reason that the abscesses are enormously large and in our own experience one felt that any undue exploration would endanger the patient's life by an exposure to the risks of a general peritonitis. These have always been considered as being probably appendicular in origin; but since our attention was attracted to the forms of mesenteric lymphadenitis, we have come to believe that at least some of these abscesses had their origins in suppurating mesenteric lymph-glands. It is quite probable that if the appendix was the cause for the suppurations, the length of time the abscesses had been present would have been more than enough to allow the appendix to slough completely away in at least a large percentage of the cases; this is the supposition which is generally held. And yet it seems very remarkable that at least some of these do not develop some form of fecal fistula during the course of healing; for spontaneous closure of an appendix stump, or of an opening in the caput, is a very stubborn affair and one whose consummation would take many months during which, at some time or other, some indication of

intestinal discharge ought to be visible. The great majority of these have, however, healed very quickly and the healing has been permanent.

The relationship of the cases of tuberculous mesenteric lymphadenitis to the simple cases of Groups I and II are open to speculation. In a certain number, we believe that no connection of any kind exists. In a few the apparent clinical benignity of the simple type of case may very well hide a tuberculous infection, the nature of which cannot be demonstrated because of the simple and easily controlled symptom complex and the absolute lack of any operating room, laboratory or post-mortem room evidence of any kind. Some of the cases in Group II may also primarily be due to a tuberculous infection and the suppuration indicates that a mixed infection with pyogenic organisms has occurred and liquefaction has consequently taken place. From other experiences it is common knowledge that this sequence of events is entirely possible and the eventual permanent healing should not necessarily be accepted as proof of the non-tuberculous nature of the infection but equally so that nature aided by operation has been effective in throwing off all tuberculous tissues and in thus permitting the subsequent healing. On the other hand, in Case VI of Group II, this possibility has been excluded by all available tests.

These three groups of cases parallel lesions of lymph-nodes which are not at all unusual and which are matters of daily occurrence when the glands are situated in other more accessible regions of the body. The affections are especially common in the lymph-nodes of the neck and a lymphadenitis in that locality and of any of the varieties described—simple, suppurative, or tuberculous—calls for no special attention or remark. It is, however, necessary to know that similar pathological lesions do occur in the intra-abdominal lymph-nodes, especially the simple non-tuberculous forms of lymphadenitis.

The terminal lesions described in Group IV are undoubtedly similar to calcifications encountered in lymph-nodes in other parts of the body. Once the calcification is present it frequently becomes impossible to be certain whether the preëxisting lesion has been of the tuberculous or of the simple variety. The common teaching has hitherto been that calcification is the terminal healing stage of a tuberculous infection. Whether this is so or whether it is another of the teachings which, having been automatically accepted and repeated, must now be unlearned, seems incapable of demonstration, but there is no reason apparent why calcification may not also be the healing stage of simple suppurative inflammations.

The etiological mechanism of the intra-abdominal adenopathies presents many points of interest. Since the nodes draining the lower ileum, appendix and cæcum are the ones involved, the causative facts must be looked for in these organs. It is possible that tiny ulcerations, abrasions or lacerations of the intestinal mucosa may be present and form the portal of entry for the bacteria but these have never been described, and the opportunity to search for them has not been presented. A history of a preceding gastroenteritis is never present. It is possible that the infection may be transmitted through

some pathological formation, such as a diverticulum: at the moment of operation these are unusually not demonstrable and post-mortem evidence is not available.

A very important point to decide is the rôle the appendix plays in these forms of mesenteric lymphadenitis, or whether the appendix has no relation to this symptom complex. The available data are as follows:

1. Enlargement of the mesenteric lymph-nodes is practically never seen with the ordinary types of acute appendicitis however bad the local pathology may be. When one stops to consider this fact, it seems very remarkable.

2. In the cases of mesenteric lymphadenitis which we have seen there have been no pathological changes in the appendix.

3. In typhoid fever, which for practical purposes may be considered as a mesenteric lymphadenitis with local lesions in the Peyer's patches and in the mesenteric lymph-nodes, and with the general constitutional disturbances accompanying a bacteræmia, the appendix is regularly not involved in the local pathological changes. The presence of the swelling of Peyer's patches and the enlargement of the mesenteric glands indicate accurately the course of the progression of the infection.

In view of these facts it seems correct to assume that appendicular infection does not precede mesenteric lymphadenitis and that there are no clinical relationships between the two.

The question of metastatic blood infections does not enter here as lymphatic infections of this kind are invariably those which spread by continuity along the lymphatic channels.

There seems to be an exact analogy between the anatomical arrangements and relationships of the cervical lymph-nodes and the lymphatic apparatus of the neck and those of the mesenteric glands, and the intra-abdominal lymphatic apparatus. Each set of glands is in direct relationship with a segment of surface of the alimentary canal. In both the pharynx and in the wall of the terminal ileum, masses of lymphadenoid tissue have become collected which in the neck are the tonsils and in the terminal ileum the Peyer's patches. In either instance the lymphadenoid collections in the wall of the alimentary canal (tonsils, Peyer's patches) form the first point of blockage and filtration of the lymphatic stream, and the cervical and mesenteric lymph-nodes form the second points of blockage and filtration. In either case the lymphatic flow is towards the thoracic duct.

In any case it is probable that the lymphadenoid apparatus of the intestinal wall—the Peyer's patches—play a rôle similar to that which the tonsils do in the cervical variety of lymphadenitis. The Peyer's patches, similarly to the tonsils, form the point of entry for the infecting bacteria. There has been no opportunity, thus far, to study the histological character of the lymphadenoid tissue of Peyer's patches in this syndrome but it does not seem unreasonable to assume, and all the available evidence points strongly to the assumption, that similarly to the case in the tonsils, perceptible lesions may or may not be present in the Peyer's patches in the presence of mesenteric lymph-

adenitis. Whatever one knows about the mechanism of the entrance of infection through the tonsils undoubtedly applies with equal certainty to the Peyer's patches.

Blockage of the infection in the mesenteric glands after the bacteria have passed through the Peyer's patches is exactly similar in mechanism to blockage of the infection in the cervical glands after the bacteria have passed through the tonsils. Similar resultant lesions then occur in the mesenteric glands as described and illustrated by the clinical reports in this communication, as would and do occur in the neck. As indicated in this report these include the simple and suppurative forms of adenitis and hyperplasia, as well as tuberculous infections and terminal calcifications.

It is a curious fact that in some of the patients whom we have observed the abdominal adenitis has seemingly been part of a process in which more than one group of glands have been involved. In two of the patients described in this report a cervical adenitis had preceded the inflammation in the abdominal group of glands; in one of these cases the infection was of the tuberculous variety. In these two cases there was an interval between the two manifestations. In the case of which the clinical notes are herewith given, the process coexisted in both the cervical and mesenteric groups of glands.

Case IX.—When the patient was eight months old he began to manifest an abdominal disturbance which occurred in irregular attacks and the chief symptom of which was an abdominal pain of indefinite description. This recurred at irregular intervals. No definite diagnosis was ever made, but at no time was the diagnosis of appendicitis entertained.

At the age of five years the patient again had an attack of this sort. The abdominal pain was referred to the umbilical region and the right half of the abdomen; it was not associated with vomiting; and the bowels were constipated. At the beginning there was moderate temperature. After the first week swelling of the cervical glands occurred and the temperature assumed a remittent type in which the daily variations extended from 96° F. to 104° F.; this continued for about one week. The swelling of the cervical glands then subsided and the temperature fell to normal and remained there for several days. Then the abdominal pain returned, the temperature rose again and assumed its previous course and the child looked very ill. The patient was seen about this time by one of us (Wilensky) in consultation.

At this time the physical examination was entirely negative with the exception of the presence of a tumefaction in the right side of the abdomen about opposite the umbilicus. There was some tenderness over the mass but no rigidity. The appendicular region was singularly free from any objective signs. The examination of the urine showed nothing abnormal; the urine was grossly clear; and there were no abnormal elements in the sediment. The white blood count was 14,500; the polymorphonuclear count was fifty per cent. The Widal reaction and Von Pirquet test were negative. X-ray examination of the genito-urinary tract showed nothing abnormal during the succeeding three days, the tumefaction gradually lessened in size and disappeared; the temperature came down to normal and remained at the normal level; and there was a spontaneous disappearance of all other symptoms.

The impression presented was that the abdominal symptoms were due to a lesion in the mesenteric glands similar to that which had been present in the cervical lymph-nodes. The disappearance of the abdominal mass was exactly comparable to the disappearance of any swelling in the cervical lymph-nodes.

Differential Diagnosis.—The differential diagnosis of mesenteric lymphadenitis is a very difficult matter as the discrimination depends very largely upon accumulated experience, often based upon and supported by a knowledge of the relative frequency of occurrence of the various lesions which might be encountered. The chief lesions to be differentiated from abdominal lymphadenitis include:

1. Acute appendicitis. 2. Acute diverticulitis—either in a Meckel's diverticulum or in any other.

Whether or not a tumefaction is present and is palpable through the abdominal wall apparently makes little difference. It is frequently impossible to make the differentiation, as the physical characteristics of terminal pathology were the same in all of the cases.

3. Acute gastroenteritis in children. Undoubtedly some cases of lymphadenitis are discharged from medical care with the diagnosis of gastroenteritis. In the differential diagnosis the presence of diarrhœa would be very important.

4. Abdominal grippe. Here again some cases at least of lymphadenitis undoubtedly are mistaken for the milder types of abdominal grippe especially during the times when influenza is epidemic. This differentiation is also a matter of great difficulty.

5. Acute intestinal obstruction of minor grades. The differentiation should be made very easily.

6. Ureteral stone. In cases of terminal calcification of the nodes X-ray picture will show a shadow similar to a ureteral calculus. The symptom complex and physical findings do not aid materially. The diagnosis should be made by the usual urological methods of diagnosis.

7. Typhoid fever. Mild cases of typhoid fever might conceivably be confused with cases of mesenteric lymphadenitis. The differentiation, however, should be easily made.

8. Intestinal parasites. The diagnosis should be easily made after proper examination of the stools.

SUMMARY

1. Mesenteric lymphadenitis is a definite clinical syndrome which is easily mistaken for acute appendicitis, abdominal grippe, gastroenteritis, etc.

2. Mesenteric lymphadenitis may be of the following varieties:

I. Pyogenic.
   A. Simple.
   B. Suppurative.
   C. Calcified.

II. Tuberculous.

The pyogenic variety is distinct from the tuberculous variety.

3. If a diagnosis can be made, conservative treatment is indicated except in the suppurative type of lymphadenitis.

We thank Doctor A. V. Moschcowitz and Doctor Edwin Beer for the privilege of citing cases from their services in Mt. Sinai Hospital.

The slide for Fig. 1, was kindly furnished by Doctor Mandlebaum.

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PENETRATING BULLET-WOUND OF THORACIC AORTA FOLLOWED BY LODGEMENT OF THE BULLET IN THE FEMORAL ARTERY*

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In the following case there are reasons to believe that the bullet entered the thoracic aorta, caused immediately a large hæmothorax, was carried downward and lodged in the femoral artery. Moreover, there are no reasons to believe that it could have gained entrance to the femoral artery in any other way. There was no evidence of injury to the retroperitoneal structures. The external iliac-femoral artery was thoroughly examined at operation almost to its origin, and there was no wound of this vessel.

Case No. 4937.—Colored man, aged thirty-six, May, 1925. While running down stairs to escape attack by the husband of the woman upon whom he was calling, was shot by a pistol bullet from above. The bullet entered the left side of the back just internal to the vertebral border of the scapula. The man continued to run a short distance but his left leg gave way and he was compelled to stop. He was brought to St. Phillip Hospital in the ambulance. His chief complaint was of a bullet in his body and of weakness and pain in the left leg.

Examination showed the point of entrance of the bullet as indicated above; positive evidence of a large effusion in the left chest; there was no cough nor expectoration; no more dyspnœa than would have been noted from simple fright, and no displacement of the heart. Abdominal examination was negative. There was great pain and weakness in the left lower extremity; motion and sensation were both present; reflexes were normal; no arterial pulse could be felt in the lower extremity below the groin; the common femoral pulse was normal but terminated abruptly at a point two inches below Poupart's ligament; there was no bruit nor venous distention; no obvious alteration of surface temperature of the two extremities; capillary response on the affected side was extremely sluggish but present.

The man was treated symptomatically and the next morning he had no serious symptoms nor any great pain. X-ray examination at this time showed a large amount of fluid and a small fragment of bullet in the left chest and slight displacement of the heart toward the right. The bullet was located in the soft tissues of the groin, one inch beneath the skin, at a point two inches below Poupart's ligament exactly in the region of the femoral artery. No bone lesion was found in any part of the chest or scapula nor in the region of the hip and pelvis. Blood and urine examination were negative.

The diagnosis was quite obvious; there was a penetrating wound of the chest; a large hæmothorax and a bullet wound blockage of the femoral artery.

His general condition was good and he was treated symptomatically until May 18, twelve days after admission, when the chest cavity was drained of a large quantity of old clotted blood by Dr. B. F. Eckles. Following this the man was soon convalescent and symptom-free; the bullet and arterial pulse cessation were still palpable. At the end of six weeks he was up and about, feeling well save for the pain, cramp and weakness of the leg, and the presence in the region of the femoral vessels of a bullet which in some way, most likely by wounding the vessel, had caused complete blockage of the femoral artery.

For this, operation was performed July 25, 1925. A longitudinal incision was begun

* Reported to the staff of Memorial Hospital, September, 1925.

from a point a little above Poupart's ligament, extending downward over the vessel about four inches. The internal saphenous vein, encountered in the field, was doubly ligated and divided between ligatures. The common femoral vessels were then identified at a point slightly above the location of the bullet, a temporary ligature of tape was put around the beginning of the common femoral artery. This was twisted rather than tied to occlude the blood current because we had learned from experience that a twisted

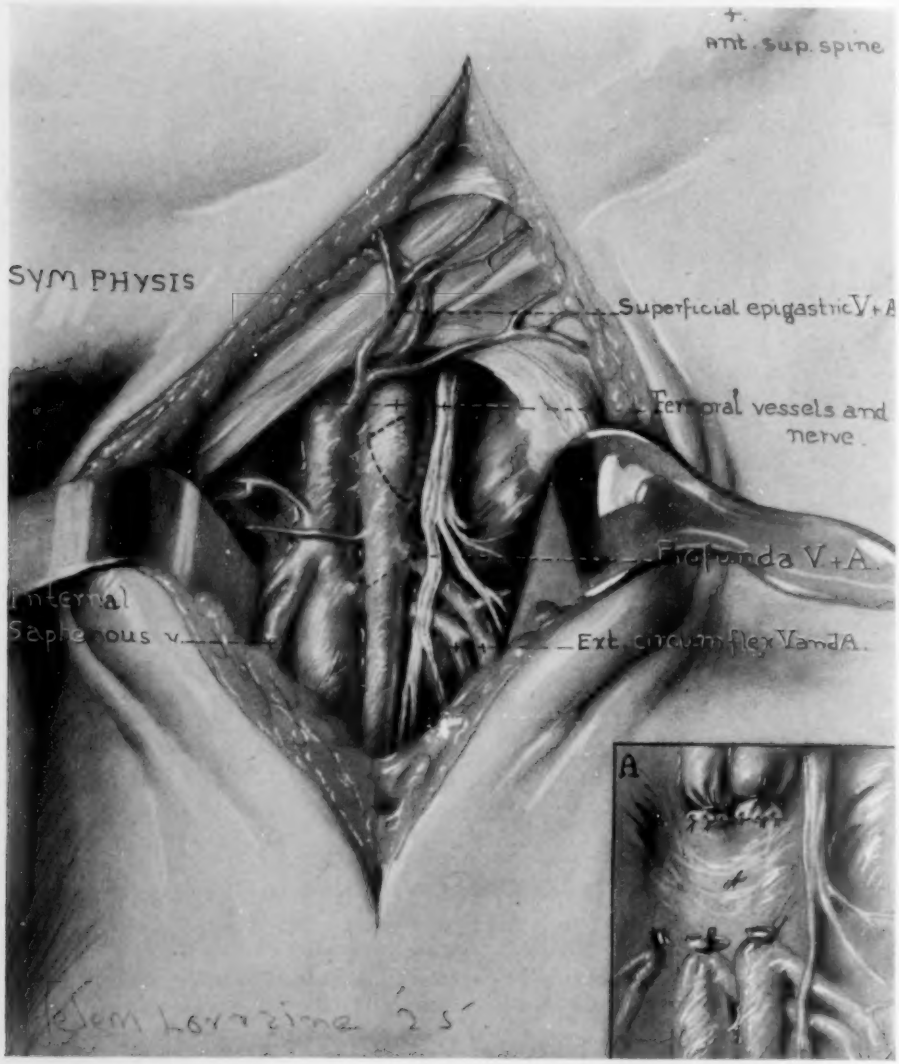

FIG. 1.—Bullet lodged in the common femoral artery. Insert shows appearance after excision of vessels.

ligature could be more easily removed than one which had been tied. With the circulation thus controlled, the artery and vein were freely exposed downward in search of the lesion. Much to our surprise we found the artery and vein perfectly normal to all external appearance. There was no injury of any kind. The bullet was easily palpated and its position easily seen. (Fig. 1) Loosening the temporary ligature, pulsation was normal exactly to a point of the location of the bullet; the artery for two inches above was dilated and for three inches below contracted to about half the size of the portion above

the bullet. At this point we searched the parent artery by dissecting it out from its bed as far upward as the peritoneal covering, being careful to avoid injury to the deep epigastric and other branches. There was not the slightest appearance of injury, the tissues and vessels being perfectly normal.

At this point two questions arose; first—should we incise the artery, remove the bullet and suture the vessel? From a study of the subject on a previous occasion[1] and upon a basis of experience in four other cases in which the femoral artery was excised for bullet wound, I had no hesitancy in excising two inches of the artery in the present case.

The other question concerned dealing with the femoral vein. Experience and the teachings of Makins[2] and W. S. Halsted[3] could leave no question of doubt; the accompanying vein, even though perfectly normal, should always be removed whenever for any reason it becomes necessary to ligate a large artery. These two questions being settled, we proceeded at once to excise the artery and vein well above and below the bullet. Permanent ligatures of silk were applied, the vessels cut between the ligatures and two inches of the artery containing the bullet, and its accompanying vein were removed intact. With the vessels thoroughly ligated above and below the portion to be removed, a surprising phenomena was observed; the vein was seen to bulge, become distended very quickly and so tightly that the upper ligature blew off and there was a welling up of blood. This was seen to come from a tributary on the posterior aspect of the vein through which blood was coming to the ligated portion. The tributary was ligated and the field was dry. In addition to the single silk ligature around the large vessels, three interrupted fine silk sutures were placed on the proximal ends of the artery and vein as shown in the pictures. (Fig. 1.) The profundus femoris vein also was ligated. The profundus femoris artery was not involved, the arterial ligature was placed above this branch. The temporary ligature was removed, the wound found to be dry and was closed tightly without drainage. The capillary response in the toes at the conclusion of the operation seemed more prompt and conspicuous than before operation. Examination of the interior of the artery shows destruction of the intima as illustrated and the danger of thrombosis following simple arteriotomy and suture is made apparent and very real.

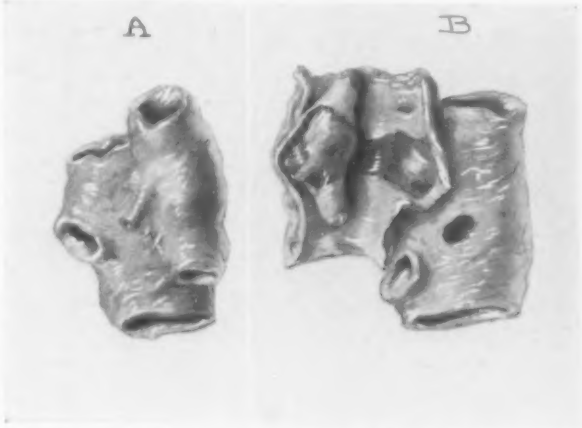

FIG. 2.—Drawing of formalin specimen of resected femoral artery and vein. A, viewed from in front. B, viewed posteriorly with artery cut open to show bullet. Note injury to intima.

The patient was kept in bed with the extremity wrapped in blankets and surrounded by hot water bottles for several days. His convalescence was uncomplicated; at the end of two weeks he was up and walking around the ward.

At no time following operation did he have pain and at no time was his circulation in jeopardy; his capillary response on the injured side was no different from the normal.

At no time, either before or following operation, was it possible to detect any arterial pulse below the lesion, the popliteal, tibials and arteries of the foot were examined daily.

Since his discharge from the hospital we have not been able to find him. It is almost certain that if he had been sick or had any trouble with his leg I would have seen him, for there are only two hospitals here to which he could have gone and I certainly would have been notified.

The value of reporting a rare and unique case is greatly enhanced if in its study we can elicit any information which will aid us in the solution of the problems involved in the care of cases of more common occurrence. I have in five patients excised the ilio-femoral artery and vein. In one there was arteriovenous fistula, there were four cases of injury of both vessels and this one of foreign body. In all cases there were perfect results, without disturbance of the circulation in the limb and without return to palpation of arterial pulsation below the point of ligature. A comprehensive study of the subject was published in the ANNALS OF SURGERY, March, 1920. Another case was reported in June, 1921; two other cases of injury to the superficial femoral artery and vein not yet reported, and this one of a bullet entering the thoracic aorta and lodged in the femoral artery is the fifth.

Until one is actually shown it seems incredible that a bullet fired from a revolver could enter the thoracic aorta, pass on in the lumen of this vessel and lodge in the common femoral artery. Just exactly this thing is possible, however, and several proven cases are recorded.

Makins [2] records a case of a patient who sustained a perforated wound of the chest from which, within twenty-four hours, four pints of blood were evacuated, following which the patient died on the fifth day of streptococcic infection. At autopsy the areolar tissue of the posterior mediastinum was densely infiltrated with blood clots, but no aneurism was present. A slit aperture of entry was found in the descending aorta, and the bullet which had caused this wound was found in the right common iliac artery. There was no reason to assume from the conditions discovered that the patient might not have recovered so far as the aortic injury was concerned. Makins records two other cases showing conclusively that wounds of the thoracic and abdominal aorta by bullets of small calibre or minute particles of shell, may heal spontaneously.

Matas [4] has collected from literature five cases of migration of bullets and other projectiles entering the heart and aorta and carried by the blood stream to be arrested in arteries of smaller calibre. Four of these entered the heart; two in the common iliac and two in the femoral arteries. Of these, the two cases of lodgement in the common femoral artery were followed by gangrene, and the one common iliac by thrombosis but not by gangrene. There are also recorded a number of remarkable cases of migration of bullets by way of the veins.

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A STUDY IN THE DISINFECTION OF THE HANDS

By Howard Lilienthal, M.D.
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In the antiseptic technic of operative surgery the disinfection of the hands has always been considered of prime importance. With the introduction of the epoch marked by the employment of rubber gloves, introduced by the late William S. Halsted, a great advance was made, but perfection has not yet been attained, as any one may easily prove for himself by taking cultures systematically of scrapings from the subungual spaces.

An occasional wound infection which can be traced to a torn glove shows that the matter is one upon which the last word has not been spoken and the difference in method encountered in the operating rooms of various hospitals is an indication of at least a certain amount of doubt or dissatisfaction. Moreover, the particularly good results obtained in operations in which no hand, gloved or otherwise, is brought into contact with the field of operation form another evidence of this weak link in the chain of asepsis. Thus the percentage of infections in operations upon the interior of the eyeball such as the extraction of cataract, and the perfection attained by Lane's technic in the open treatment of fractures, still further illustrate the necessity of striving for an ideal in hand disinfection.

The first principle of cleansing the skin is the mechanical one. This has been attempted by scrubbing and the employment of the timing sandglass to insure a sufficiently long period for this procedure. Still, the stiffness of the brush and the vigorousness of the scrubber must also be taken into consideration and here the element of human error enters. No two persons scrub their hands exactly alike and three minutes with one individual may be more efficient than five minutes with another.

I will not speak here of the appearance upon the surface of organisms from the deeper layers of the skin incident to the perspiration which occurs when rubber gloves are worn, for this is something which I believe is impossible to correct; but we should at least start an operation with hands as clean as they can be made.

In the past, attempts to prove the efficacy of mechanical measures have been made by taking cultures from the well-scrubbed hands, either with or without previously contaminating them with living organisms. This method is naturally inaccurate, however, because these cultures have to be taken haphazard from various parts of the skin surface.

It occurred to one of us (Lilienthal) that a test of mechanical cleanliness could be made by covering the hands with an easily visible substance, which

* Read before the New York Surgical Society, March 24, 1926.

should not be a dye, and scrubbing until all traces of it had disappeared. We might then assume at least that the dirt from all parts of the hands had been removed so far as the ocular proof could demonstrate.

A mixture of lampblack and oil was selected as a suitable material for this purpose. Smearing the hands, not the arms, the appearance was as if a pair of perfectly fitting black gloves had been put on. Scrubbing now with the usual green soap we soon found that it was impossible to remove all of the lampblack, no matter how long the process was continued (up to twenty minutes). Even after scrubbing with a special brush made to clean the spaces beneath the nails, the telltale mourning band was still apparent. Moreover, bacteriological experiments by one of us (Ziegler) indicated that living organisms were present wherever the lampblack had not been removed. It was also shown that mechanical cleansing had been efficient on the surfaces where the black had been scrubbed away. We have found that organisms will not grow in lampblack and cottonseed oil, although the mixture is not truly bactericidal.

These tests were made not merely from the surface of the skin, but by taking scrapings with a knife previously heated to redness and then permitted to cool. Thus actual masses of the horny epithelium were used in the cultures. This is much more effective than merely touching or scraping the surface with a platinum loop.

From experience with hands soiled by the black machine grease from an automobile engine, certain of the commercial cleansing pastes or mixtures were found to be superior to green soap in their power to eradicate the foreign matter.

There are a number of these substances on the market which do not contain abrasives. The one chosen for our experiments (which we will call Cleanser No. 1 †) is very efficient removing the greater part of the lampblack mixture in a fraction of the time required by green soap; but it was not possible to eradicate every trace of black from the subungual and periungual regions. It has no irritating effect upon the hands and is in this respect distinctly preferable to the green soap. It has some antiseptic power—probably not as great as that of the sapo viridis. No accurate comparison was made, however, between the bactericidal potency of the two substances. The wholesale price is about the same. The manufacturers of this substance have refused to divulge its composition. At our request, therefore, Dr. Joseph Reiss in the Department of Chemistry, at Mt. Sinai Hospital (Dr. S. Bookman, Director), made a superficial analysis and reported that the material is a soap containing 85 per cent. water, a small amount of free alkali and various volatile oils. The consistency is that of a paste.

Since thorough scrubbing will sterilize the surfaces of the hands except the parts around the nails, we may conclude that ordinary cleansing by this method is efficient and when supplemented by the usual alcohol scrub it may

† Sold under the name of Spee Dee.

be assumed that asepsis has been established. With the finger tips, however, a surer method must be employed.

Shortly after the almost universal acceptance of Grossich's technic for sterilizing the skin of the patient, one of us (Lilienthal) adopted, and has employed regularly, the following method for sterilizing the surgeon's fingers:

Before the first operation of the morning or afternoon, the perfectly dry finger tips are immersed in U. S. P. Tincture of Iodine, so as to cover completely the nails and spaces around them up to the terminal phalangeal joint. This is allowed to dry thoroughly. The scrubbing process is then carried out in the usual manner, the hot water removing a great deal of the iodine. At the end of the first operation when the gloves are removed, all traces of the iodine will have disappeared. There is not the slightest skin irritation nor other untoward effect. The reasoning was that if iodine would disinfect the dry skin of the patient, it would manifestly disinfect the fingers of the surgeon.

The procedure proved so convincing that for about ten years many of those who have been associated with Doctor Lilienthal in his hospital service have been employing this method. We have now found by bacteriological tests (Ziegler) that iodine thus employed and permitted to dry for from three to five minutes will completely sterilize the spaces about the nails.

After the hands have once been thoroughly cleansed, it is not necessary to use iodine before succeeding operations unless, through some accident, contamination of the surgeon's hands has occurred when it is advised that the full technic be repeated. Moreover, after clinical tests, we believe that the use of the lampblack mixture is not necessary as a routine, *but that it is most important as a training for those who wish to perfect themselves in operating room technic, both nurses and doctors.* The steps of the procedure are as follows:

1. Immerse the dry finger tips in tincture of iodine, immediately removing them and permitting the tincture to dry for five minutes.
2. While this is going on the remainder of the hands, including wrists, should be painted with the lampblack mixture up to the limits of the iodine.
3. Wash the hands by rubbing with the cleanser without water for about one-half minute.
4. Rinse under hot running water.
5. Scrub with the cleanser and brush until all traces of lampblack have disappeared, scrubbing the arms as usual at the same time.
6. Scrub with alcohol in the usual fashion.

It will then be found that most of the iodine discoloration will have disappeared. The hands may now be dried with sterile towels and the gloves and gown put on.

We recognize that it is difficult to change the habits of surgeons, but we believe that we have demonstrated a method which is superior to those at present in vogue. We would insist that whether the lampblack be used or

not, the employment of tincture of iodine in the disinfection of the spaces around the nails is a most effective and practical method of sterilization and we strongly recommend that it should be practiced as a routine. There need be no fear that the slightest stain or irritation will persist after thorough scrubbing in hot water and after wearing rubber gloves for the duration of the average surgical procedure.‡

Experiments on Scrubbing and Sterilizing the Hands after Applying Lampblack and Cottonseed Oil Mixture with and without Iodine Sterilization of Finger Tips§

(The mixture consists of lampblack and cottonseed oil 50 gms. to 200 c.c. stirred thoroughly until a thick, homogeneous liquid is obtained.)

I. *Streaked Agar Plates—Incubate for Twenty-four Hours.*

1. Scrapings from under finger nail.—Staphylococcus Albus.
2. Finger tips dipped in tincture of iodine.
   Dried—waited five minutes.
   Scrapings from under finger nail—sterile.
3. Scrapings from dorsum of hand.—Staphylococcus Albus.
4. Lampblack mixture rubbed on skin.
   Scrubbed for ten minutes with Cleanser No. 2. (Not No. 1.)
   Scrapings from dorsum of hand—sterile.
   Scrapings from surface of finger nail—sterile.
   Scrapings from thenar eminence—sterile.
   Scrapings from under finger nail. } Staphylococcus Albus.
   No preliminary use of iodine. }

II. *Poured Agar Plates—Incubated Twenty-four Hours.*

1. Scrapings from under finger nail—Staphylococcus Albus.
2. Finger tips dipped in tincture of iodine (7 per cent.).
   Dried—no waiting.
   Scrapings from under finger nail.—Staphylococcus Albus.
3. Scrapings from back of hand—sterile.
4. Scrapings from thenar eminence.—Staphylococcus Albus.
5. Lampblack mixture rubbed on skin.
   Scrubbed for five minutes with Cleanser No. 1.
   Scrapings from back of hand—sterile.
   Scrapings from thenar eminence—sterile.
   Scrapings from under finger nail. } Staphylococcus Albus.
   No preliminary use of iodine. }

III. *Poured Agar Plates—Incubated for Seventy-two Hours.*

1. Scrapings from under finger nail.—Staphylococcus Albus. (Two colonies.)
2. Finger tips dipped into tincture of iodine.
   Dried—waited three minutes.
   Scrapings from under nail—sterile.
3. Scrapings from back of hand.—Staphylococcus Albus. (Three colonies.)
4. Scrapings from thenar eminence.—Staphylococcus Albus. (Four colonies.)
5. Lampblack mixture rubbed on skin.
   Scrubbed for five minutes with Cleanser No. 1.

‡ It is recognized that certain individuals have an idiosyncrasy which renders the skin sensitive to iodine. This must be extremely rare, however—certainly rarer than the well-known iodoform idiosyncrasy. Obviously anyone suffering in this way will not be able to employ this method.

§ From the Department of Surgical Research, College of Physicians and Surgeons, Columbia University.

Scrapings from back of hand—sterile.
Scrapings from thenar eminence—sterile.
Scrapings from hypothenar eminence—sterile.

IV. *Poured Agar Plates—Incubated Twenty-four Hours.*

1. Scrapings from under finger nail.—Staphylococcus Albus. (Many colonies, about 150.)
2. Finger-tips dipped into tincture of iodine.
   Dried—waited three minutes.
   Scrapings from under finger nail.—Staphylococcus Albus. (Three colonies.)
3. Scrapings from back of hand.—Staphylococcus Albus.
4. Scrapings from thenar eminence.—Staphylococcus Albus.
5. Scrapings from hypothenar eminence.—Staphylococcus Albus.
6. Lampblack mixture rubbed on skin.
   Scrubbed for five minutes with Cleanser No. 1.
   Scrapings from back of hand—sterile.
   Scrapings from thenar eminence—sterile.
   Scrapings from hypothenar eminence—sterile.

Scrapings from under finger nail. } Staphylococcus Albus. (Two colonies.)
No preliminary use of iodine. }

Iodine applied, waited three minutes. } Sterile.
Scrapings from under finger nail. }

Experiments with Tincture of Iodine—Seven Per Cent.

Poured Agar Plates—Incubated for Twenty-four Hours.

No preliminary use of iodine. } Staphylococcus Albus.
Scrapings from under finger nail. }

Finger tips immersed in tincture of iodine.
Scrapings from under finger nail.
Immediately after immersion.—Staphylococcus Albus.
After waiting for iodine to dry.—Staphylococcus Albus.

Fingers dry and waited three minutes. } Staphylococcus Albus. (Obtained occasionally.)

Fingers dry and waited five minutes. } Sterile.

The above experiments were carried out five times. To obtain sterility the minimum time of waiting when the tips of the fingers were immersed in tincture of iodine solution was three minutes after the iodine had dried. It is better to wait five minutes after the iodine solution dries to be certain of sterility of the finger nails and before applying the lampblack mixture and commencing to scrub.

Experiments with Lampblack and Oil Mixture

I. *Cultures from Lampblack and Oil Mixture Standing at Room Temperature for Seven Days.*

1. In meat extract broth—1 per cent. dextrose after twenty-four hours and forty-eight hours. } Sterile.

2. In Agar Stab after twenty-four hours and forty-eight hours. } Sterile.

(Above repeated three times.)

II. *Cultures from Lampblack and Oil Mixture. Incubated for Seventy-two Hours.* } Sterile.

III. *Cultures from Lampblack and Oil Mixture. Standing at Room Temperature for Ten Days.*

1. Poured Agar Plates after twenty-four hours and forty-eight hours. } Sterile.

IV. *Lampblack Mixture Standing Fourteen Days.*

1. Poured Agar Plates after twenty-four hours and forty-eight hours. } Sterile.

From the above experiments one may deduce that the common organisms do not grow in the lampblack mixture standing exposed at room temperature.

V. *Meat Extract Broth—1 Per cent. Dextrose 4 c.c. in 4 c.c. of Lampblack and Oil Mixture.*

Above mixture shaken well and inoculated with:

B. prodigiosus—incubated for twenty-four hours.

B. prodigiosus grows readily in above mixture.

(Mixture has no antiseptic qualities.)

(Test repeated three times.)

VI. *B. Prodigiosus Rubbed on Hand.*

Lampblack and oil mixture applied.

Scrubbed with Cleanser No. 1 for five minutes.

Poured Agar Plates—incubated twenty-four hours and forty-eight hours.

Scrapings from palm of hand—sterile.

Scrapings from back of hand—sterile.

(Repeated three times.)

VII. *Agar Plate Streaked with B. Prodigiosus.*

Cleanser No. 1 poured into plate.

Incubated for twenty-four hours and forty-eight hours.—No growth of B. prodigiosus.

TRANSACTIONS
OF THE
NEW YORK SURGICAL SOCIETY

Stated Meeting Held March 10, 1926

The President, Dr. Walton Martin, in the Chair

BIRTH FRACTURE OF THE SHAFT OF THE FEMUR, EIGHT YEARS AFTER INJURY

Doctor Edward D. Truesdell presented a boy, now nearly nine years of age, who came under his care when three weeks old, having sustained a birth fracture of the left femur. The fracture was situated near the centre of the shaft, as is commonly the case, and the fragments were firmly united in a position of marked anterior angulation. At the present time the leg is one-quarter of an inch short. There are no disabilities of any sort. The examination of the leg is negative, except that upon X-ray examination there is seen to persist a very slight anterior curvature of the upper part of the shaft of the femur. Doctor Truesdell presented lantern slides showing the condition of the fracture when first coming under his care at the age of three weeks; also lantern slides showing the condition of the femur fifteen months after injury —the anterior angulation now being represented by an excessive anterior curvature. Another lantern slide showed the fracture four years after occurrence, with but little diminution of the anterior curvature. X-ray observations made in 1925 and 1926 showed a very remarkable diminution of the anterior curvature, the X-ray made in March of this year showing an almost complete elimination of the deformity.

Doctor Truesdell also presented lantern slides showing a case of birth fracture of the humerus uniting with an outward angular deformity that had eliminated this deformity entirely during the first two years. He stated that the case of birth-fracture of the femur presented was particularly instructive since it changed his idea about these injuries almost completely. Having followed a number of these cases for five or six years, he had come to the conclusion that anterior curvatures of the femur persisted in contrast to the curvatures observed in the humerus, which disappeared uniformly in two years, and this probably because of weight-bearing. However in the case presented an extreme deformity was seen to disappear between the fifth and eighth years of life, showing that, if this case can be regarded as a criterion, while these deformities may persist longer than do the deformities of the humerus, they will eventually clear up even several years after the patient begins to walk. He said that he also believed that similar deformities consequent upon unreduced birth-dislocations of the lower femoral epiphysis might be depended upon to behave in the same way.

CONGENITAL CERVICAL MENINGOCELE EIGHT YEARS AFTER OPERATION

Doctor Truesdell presented a little girl upon whom he had operated in September, 1916, when one month of age, for the removal of a cervical meningocele. The tumor was about the size of a plum, pedunculated, and was removed by an elliptical incision about the base. The stem, or stalk, of the tumor narrowed down until it passed between the fifth and sixth cervical vertebræ into the spinal canal. No direct communication was dis-

covered with the space surrounding the spinal cord. This sac was ligated and cut away and the wound closed. The patient made an uneventful recovery, and has been well ever since, having developed none of the symptoms so frequently following the removal of meningoceles from other situations.

Doctor Truesdell also presented a photograph of another child, now eight years of age, on whom he operated in December, 1918, for an identical condition. He also cited a third case, a child of ten years of age, who had come under his care for another condition, who, from the location and appearance of the operative scar and from the mother's history of the case, had had a cervical meningocele.

This patient was presented, and the other two cases cited, to demonstrate the difference in significance and prognosis between cervical meningoceles and meningoceles occurring sub-occipitally or in the lumbar region accompanying spina bifida. The cervical meningoceles would seem to be of merely local significance and compatible with normal development following their removal.

INFLAMMATORY CARCINOMA OF THE FEMALE BREAST

Doctor Burton J. Lee presented three cases of inflammatory carcinoma of the breast. All three were diagnosed as primary and inoperable. These were classified under this heading, both because of the clinical findings and because this type of mammary cancer in most instances warrants such classification.

Case I.—Mrs. C. W., white, aged thirty-five, had one miscarriage, no pregnancies. Eight years previous she had a hair follicle infection in the left axilla and two years later an abscess in the left breast, which discharged without surgical intervention. The patient felt she always had a lump in that breast since that time. In July, 1925, a small tumor appeared below the scar in the breast, slight pain developed and she reported to the clinic of the Memorial Hospital, January 11, 1926.

Physical examination at this time showed the left breast occupied in its entirety by an ill-defined tumor. The skin was reddened over most of the breast with a "pig-skin" appearance. The nipple was flattened and the whole breast elevated on the chest wall. One node was present in the left axilla and one in the left supraclavicular region. The chest plate was negative for evidence of intra-thoracic metastasis.

Treatment: Up to the present date the treatment has been high-voltage X-ray with the following set-up:

4 milliamperes of current.
9-inch spark gap.
25-inch focal distance.
½ millimetre copper.
1 millimetre aluminum filtration.

Four treatments of 80 minutes each were given, two over the breast anteriorly to include the supraclavicular region, one to the breast laterally and one to the axilla.

This cycle is now being repeated with the same set-up, but the time of the treatment has been reduced from 80 minutes to 60 minutes.

Results: There has been a moderate reduction in the size of the tumor and a slight decrease in the erythema of the skin. The patient was shown as one in the course of treatment. It is probably too early to determine just what could be expected from this therapy.

Case II.—Mrs. C. A., aged forty-six, colored. The woman had seven lactations, each of one year's duration without complications. The last was in 1921. In November, 1925, there was some induration above the right

nipple and also about that time the patient had a slight bruise of the breast. Following this the breast swelled, two weeks later, pain developed in the breast and shortly after this a slight cough was noticed. For two weeks prior to her admission to the clinic of the Memorial Hospital, flaxseed poultices had been applied for what was thought to be an inflammatory process. As no improvement was obtained, she was referred to the Memorial Hospital, February 15, 1926.

Physical examination showed a massive inflammatory carcinoma involving the entire right breast infiltrating the skin in all directions. There was beginning extension of the disease to the left breast and the right axilla was filled with a solid mass of nodes. Several nodes were palpable in the right supraclavicular fossa. The axillary nodes were also involved on the left side. Physical examination of the chest revealed fluid at the right base and the chest plate showed intrathoracic involvement on the right side.

Treatment: As this case was too far advanced to warrant intensive therapy and because the patient was in poor physical condition, intermediate dosage X-ray was decided upon. The following set-up of treatment was used:

4 milliamperes of current.
10-inch spark gap.
15-inch focal distance.
5 millimetres of aluminum filtration.
Time of treatment, 25 minutes.

The breast received two treatments anteriorly. While the lateral breast and axilla were treated for only 15 minutes, a similar set-up was used for the left breast. February 26, 1½ quarts of straw-colored fluid were obtained by thoracentesis of the right chest.

Results: Little palliation has been obtained by the treatment, although it is too early to expect much change. The disease is progressing and the patient's general condition is not as good as when she entered the clinic.

Case III.—Mrs. C. W. This woman was thirty years old at the time of her admission to the Memorial Hospital, June 27, 1922. She had had two lactations, the first in 1908 and the second in 1911, with the duration of two months and fourteen months, respectively. No complications during lactation. There was an indefinite history of trauma. The history of her breast condition at the time of admission was as follows: Two years previously she noticed in the outer portion of the right breast a small lump the size of a pea. The growth had been slow, but because of a recent appearance of redness of the skin and pain she was referred to the breast clinic.

Physical examination showed the right breast larger and heavier than the left, slight nipple retraction and " pig-skinning " above the areola. There was an indefinite tumor faction in the outer portion of the breast extending up to the axilla. Firm nodes were present in the right axilla and while the right infraclavicular space was more prominent, no definite mass could be palpated. No nodes were present in the right supraclavicular fossa. The left breast and axilla were negative and the chest plate revealed no definite evidence of pulmonary metastasis.

Treatment: The patient received one cycle consisting of four treatments of intermediate dosage X-ray in June, 1922, and in August she received two high-voltage X-ray treatments of 60 minutes each over the right breast. In October and November of the same year three more high-voltage treatments of 60 minutes each were given. The following May no definite tumor process could be palpated. In October, 1923, she became pregnant, and upon consultation a therapeutic abortion was advised and performed. At this time she received two more high-voltage X-ray treatments of 60 minutes each.

Results: Until recently only one small, firm node could be palpated in the axilla and at the present time there is no evidence of disease. The chest plate has remained negative and the patient is in excellent general condition.

Doctor Alfred S. Taylor mentioned a case similar to the ones presented by Doctor Lee, which he observed twelve years ago. The pathologist who took the gross specimen in the operating room said it was non-malignant because it was incapsulated. The specimen was shown to Doctor Elser, who said it was the most malignant of all tumors; no operation would be of any avail and in three months the patient would be dead. In fact, she was dead in three months. There was seen an extension of the growth to the ribs and the lung. No surgical intervention would seem to be of avail in cases of this type at any stage in their evolution.

Doctor Joseph Wiener said that about ten years ago he had a case of a young woman referred to him with this condition. An incision had been made in the growth by a competent surgeon for the purpose of diagnosis and in six weeks the patient was dead. He had amputated in suspicious cases with out making an incision, for in these cases it is better to remove the growth without biopsy. The breast should be removed rather than endanger the patient's life.

Doctor Eugene H. Pool said that at the present time surgeons are scarcely ready to accept the diagnosis of carcinoma of the breast when a cure is announced without histological evidence of cancer. Doctor Lee had presented a young woman as a three-year cure after radium treatment. It is difficult in seeing this case to picture the healthy youthful skin as the site of carcinoma three years ago. Various arguments have been presented against biopsy in such inflammatory carcinomata. Yet it is of vital importance, as is evident in this case, to know definitely whether or not cancer really existed. This feature outweighs the disadvantage of biopsy and this means of establishing the diagnosis should unquestionably be adopted. With such verification even a single case of this kind would be invaluable. Without such verification the case excites only uncertainty.

Doctor Nathan W. Green said that the whole question of carcinoma of the breast might be cleared up from two or three angles with great benefit to the medical profession and to the patient. Early diagnosis of carcinoma is very frequent now; that is, the tentative diagnosis. That puts the case up to the surgeon whether to make a complete positive diagnosis and to do a radical operation, or to try to effect a cure without rendering a positive diagnosis. In some institutions it is the habit to make an excision of the tumor, going wide of it on all sides, and examining a portion of this, wait for a report of the frozen section; if it is reported malignant, take off the breast by the radical operation. In other institutions the habit is not to do a biopsy previous to treatment. It is very important to know when to do one thing and when to do the other. Doctor Lee has had as many cases of carcinoma of the breast at the Memorial as anyone, and there the consensus of

opinion is that in conference of the Staff, one is able to make a diagnosis of carcinoma of the breast without the aid of the microscope, except in very rare instances, the same as a horticulturist can tell whether an evergreen tree is a pine, a spruce or a hemlock, without sectioning the wood. This is especially true of these acute carcinomata where any attempt at excising a specimen would lead through involved tissue and end in disaster. A familiarity with all forms of cancer gives one a canniness that frequently enables one to make a diagnosis without reference to a technical pathologist. But modern critical practice demands a microscopic section. At present the breast service feels competent to state when a case may safely be attacked surgically or whether it is better to treat it by some form of physiotherapy.

DOCTOR LEE said that although no section had been made of this growth, there was no doubt in his mind that the patient had a true carcinoma of the breast. Of all the cases in this group this patient was the only one in which complete regression occurred with the use of X-ray. None of the other cases were successfully treated by radiation. They have been held for two or three years, but this is the only case that has gone for over three and one-half years.

PARTIAL RESECTION OF MANDIBLE WITH RECONSTRUCTION OF CHEEK FOR ANKYLOSIS WITH FACIAL CICATRIX

DOCTOR HUGH AUCHINCLOSS presented a woman, aged eighteen years, single, who January 6, 1906, fifteen years ago, was kicked in the right leg by a horse, and treated in Bellevue Hospital. In the course of her treatment, an incision was made in right leg over upper end of tibia, and later, abscesses and gangrene of right cheek developed and were incised. She was discharged April 30, 1907, after a stay of one year and four months.

FIG. 1.—Condition on admission showing inability to open jaws.

September 24, 1907, five months later, she was readmitted to Bellevue Hospital for attention to the scar of her right cheek. An unsuccessful skin-grafting was done and she was discharged after six weeks with cicatricial deformity. Later on she was subjected to the Indian type of pedunculated flap from arm. Mother says patient was at Bellevue about five years in all. Jaw was freely movable but scar was very deforming.

About nine years ago she entered a Brooklyn hospital and submitted to a plastic operation, after which the jaw began closing tighter and tighter. Five years ago she was operated on at Mt. Sinai Hospital where the scar was excised and she was provided with a jaw-spreading machine. Improved for a time, but contracture soon became as bad as ever. The teeth in the right upper and lower jaws began to decay and she had repeated infections resulting in chronic bone infection of upper and lower alveolar ridges. These

infections pointed at the place where the cheek was adherent to the ankylosed jaws.

January 21, 1922. An epithelial inlay was attempted by Doctor Dunning at the Presbyterian Hospital with an effort to free scar tissue, but this was of no material help as it sloughed owing to the chronic infection. For the better part of a year she visited Doctor Dunning, who was able to bring the infection to a quiescent stage with cheek sinus closing. The cheek was a mass of scar cemented to both upper and lower jaws causing ankylosis. There was practically no inside mucous lining to the right cheek. There was no vestibule for the mouth on the right side. As a matter of fact, the cheek on that side was more like a gum attached to the alveolar processes than a cheek. With this view of the deformity, it seemed plausible to leave the old cheek attached to the bone, reconstruct a new cheek outside of it by grafting a double-faced, pedunculated flap from the shoulder and subsequently cut through the old cheek between upper and lower jaws in the hope that, if incised far enough back, the jaw might be opened.

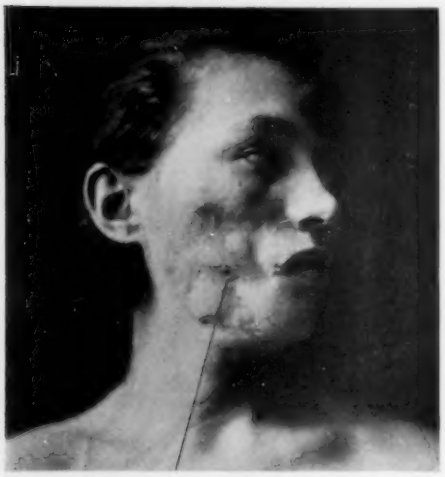

FIG. 2.—Condition on admission showing paralysis of facial muscles on right side of mouth and adherence of cheek to alveolar margins of upper and lower jaws.

This operation was done February 28, 1923, suturing the superior and posterior sides of the reduplicated flap to the cheek above and behind after making a right-angle incision in the cheek above and behind the scar tissue. The position was retained by means of a large plaster bandage about the head and shoulders. Thiersch skin grafts from thigh were applied to the denuded shoulder. Ten days later, the flap was cut free. Considerable growth of hair took place on this flap. She had an attack of influenza then, there being an epidemic at the time. This delayed the operative procedures.

Seven weeks later, April 21, 1923, the lower margin of the flap was sutured to the edges of an incision made near the lower margin of the mandible. This left a pouch with the opening toward the mouth.

FIG. 3.—Operation February 28, 1923. Suture of posterior and superior edges of pedunculated flap taken from behind her shoulder. This flap is reduplicated, the anterior edge forming the hinge. When attached below and anteriorly it forms a new cheek. Photo taken May 12, 1923, two months and twelve days after operation.

Eleven weeks after the graft, May 19, 1923, the hinged free edge toward the mouth was incised and sutured to a vertical incision made through the old cheek just outside the commissure of the mouth. This provided an excellent vestibule and the newly constructed cheek allowed a finger to be readily

passed between its inner surface and the teeth. The old scar tissue of her original cheek was then freely divided well back to the ascending ramus of the mandible. It was disheartening to find, however, that the jaws could not be separated any more than before. She was sent home June 3, 1923, with a wedge to be used to increase the range of jaw motion. She made very little, if any, progress all summer. A band of scar tissue to the mandible near the mouth edge of the graft was very dense.

FIG. 4.—The new cheek has been attached on all sides and effort made by section of masseter and pterygoid muscles to open the jaw without avail. The thirteenth operation on January 7, 1924, resected much scar tissue and a part of the mandible. Photo taken one month later showing ability to open jaw but an opening into the mouth made at the time of the operation. A little mandible shows in the wound.

September 27, 1923, this scar band was excised and a good sized free epithelial inlay on modelling composition was buried beneath the mucosa alongside the mandible. This improved the size of the vestibule somewhat. It was then considered possible that the masseter and pterygoid muscles were involved in the scar and were the factors maintaining ankylosis.

December 1, 1923, through an incision below mandible, the masseteric and pterygoid attachments were separated from their outer and inner surfaces and some scar tissue in front was removed. Absolutely no improvement resulted. Upon consultation with Doctor Semken, it was agreed that the only thing to do further was to expose and remove the cicatrix thoroughly, no matter how drastic a procedure had to be resorted to, and that the main scar existed about the infected teeth. X-ray plates taken by Doctor Imboden showed no definite evidence of temporo-mandibular ankylosis.

FIG. 5.—Two years and one month after resection.

January 7, 1924, nearly a year after the check graft, the whole mandible was nested in scar tissue about the lower part of the ascending and posterior part of the horizontal ramus. To free the bone the following operation was carried out. Beginning at the space below the malar bone extending back to the sphenomaxillary fossa and down to the lower margin of the mandible, literally chunks of scar muscle and ligaments were carved away. Not until the mandible was partially resected leaving its inferior margin longer than its alveolar could the jaw be opened. But when this was done, it was possible to open the jaw for 1.5 cm. between the incisors, quite enough for practical purposes. Six badly infected teeth were removed and the wound approximated as well as possible, though

it was impossible to wholly close off the mouth cavity. Bleeding from the internal mammary and venous plexuses about the joint was far less than was expected. At this stage the value of the pedunculated graft was evident. The nutrition of the graft remained good throughout. An attempt to model a double-faced graft into an actual defect in a cheek with the mouth cavity open and with every chance for infection, would have been fraught with difficulty. With the graft already in place before ever opening the mouth, it was possible to dissect it with surprising impunity. Doctor McCaffery wired her teeth together with a cork inserted between them on the left side to temporarily maintain the mandible in proper position. After ten days a wooden wedge was used instead. Then a spring interdental splint.

FIG. 6.—Two years and one month after resection.

March 17, 1924, a bit of exposed mandible was removed and the buccal mucosa was brought together by a slight plastic procedure.

April 14, 1924, old osteomyelitic flare in right tibia. Incision and Dakinization.

May 10, 1924, a slight plastic was done to close cheek.

June 3, 1924, the mouth wound was healed.

October 15, 1924, epithelial inlay between cheek and superior maxilla. The graft took well and gave greater space between cheek and jaw.

November 20, 1924, another epithelial inlay was placed inside the mandible and skin grafting of tibia. Both grafts took.

February 8, 1926, all wounds healed. Can open mouth almost two cm. Doesn't want any cosmetic or plastic operations, at present anyway, and is happy.

The reasons for showing this case are:

1. The persistent and inflexible demeanor of scar tissue particularly when chronically infected.

2. The method employed by which the old cheek was used for gum and a new cheek created by double-faced graft before opening the mouth cavity.

3. That pterygoid and masseter muscles had no part in the ankylosis.

4. That resection of a bit of the jaw has been a satisfactory and comfortable procedure in this case where the temporo-mandibular joint had never had any reason to be considered diseased.

INTERSCAPULOTHORACIC AMPUTATION FOR SARCOMA OF ARM

DOCTOR HUGH AUCHINCLOSS presented a colored woman, twenty-eight years of age, who came to the Presbyterian Hospital, Out-patient Department, October 8, 1924. In 1920, during her first and only pregnancy, she noted a painless lump in her right axilla, size of a hen's egg, firm, movable, not tender. No temperature. Gradual growth to size of a small cantaloupe at end of second year.

In 1922, she entered St. Luke's Hospital and remained for a week, where she was studied. Radium was advised but refused, and there was question

as to operability. After leaving there, there was slow increase in size and more pain. Then six to seven months of more rapid progress. Beyond a slight prolongation of menses of two months previously, she had considered herself always normal. Five years ago, weight 176; now 152 pounds; pulse, 108; blood-pressure, 165/100. Though admitted and advised operation, neither she nor her husband would consider it. But she did agree to take X-ray treatments. These were given from October, 1924, to July, 1925, forty treatments in all, and she was watched and measured carefully in the Follow-up Clinic. While there was marked relief of pain, the effect upon the growth was practically negative.

October 28, 1925, she was readmitted to hospital, weak, hardly able to walk, legs œdematous, pale, dyspnœic, chest wall brawny and tender; arm fungating and inflamed; no definite evidence of metastasis. Tumor had been ulcerating for six weeks. Calcium deposits were detected in the tumor by X-ray. Hæmoglobin, 35 per cent.; red blood cells, 1,900,000. She was at last willing to submit to anything to save her life.

During the three weeks immediately following her admission to hospital, a succession of blood transfusions, five in all, were done, which brought the hæmoglobin up to 75 per cent., and the red blood cell count up to 3,920,000.

FIG. 7.—Sarcoma of arm four years after onset, one year before operation.

November 23, 1925, five weeks after admission, a right interscapulothoracic amputation was done in the axilla, showed merely hyperplasia. Subclavian artery large. Veins very large. Operated on the twenty-eighth day after admission. Up the eleventh day. On the sixteenth day walking. On the twenty-first day discharged. Tumor weighed nineteen and three-quarter pounds without the forearm. It had lobes and septa, some of which were calcified and resembled a uterine fibromyoma. Muscles: great vessels and brachial plexus " wandered into it and were lost." Several axillary nodes were considerably enlarged, but showed no tumor. They were merely hyperplastic. A thrombosed vein on the surface had canalized. Humerus was wholly free, but showed red marrow. Microscopically the tumor was made up of spindle cells with many mitoses.

Doctor Stout believed it might metastasize locally, but that it was not a malignant growth in the sense of metastasizing in distant parts. Its origin was wholly hypothetical. He called it a fibro-sarcoma of arm.

The reporter's reasons for showing the case were:

1. The four-year local growth of a connective-tissue tumor of the arm to an enormous size, forcing the patient to operation only after a secondary anæmia had reached a degree making it evident to her as well as everyone else that she was about to die.
2. That the arm might have been saved had she been operated on earlier.
3. That X-ray treatment gave temporary comfort, but nothing else.
4. That what may seem inoperable from standpoint of size may be sometimes operated on with comparative ease.
5. That repeated transfusions are of great assistance in such a case.
6. That when ulceration and "fungation" occurs, the downhill course is much more rapid.

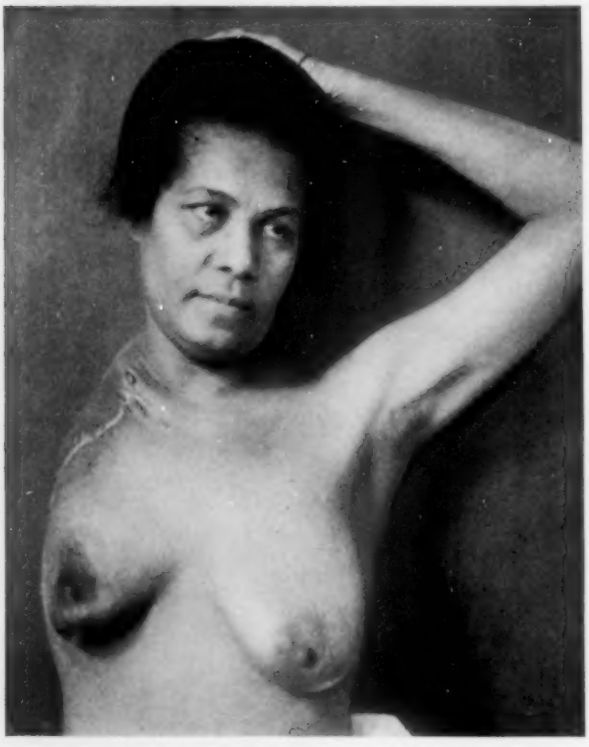

FIG. 8.—Sarcoma of arm, present condition after interscapulothoracic amputation.

Somewhat similar cases have an extremely persistent way of reappearing when removed locally. If this case does this, an effort will be made to report her condition subsequently.

CARCINOMA OF BREAST DURING PREGNANCY AND LACTATION, ASSOCIATED WITH ABSCESSES, SUBSEQUENT PREGNANCY. ULTIMATE RECOVERY

DOCTOR HUGH AUCHINCLOSS presented a woman, thirty-one years old, who came first under observation February 26, 1924. She had then just stopped nursing her eighth baby because of trouble in her left breast.

There had been a lump in this breast for a year. Two weeks before admission, an abscess developed at this site, with redness, heat, induration and fluctuating swelling. A 2.5 cm. incision was made and clear serous fluid released that grew out no organisms. A cyst was suspected, but no carcinoma, though the oozing of blood at the time persisted at subsequent dressings. Two weeks later the incision was enlarged by introducing a finger and a counter-drainage incision made. Two weeks after that a third incision was made, much foul pus evacuated, considerable bleeding encountered and she was admitted to the hospital with a temperature of 105.8° and septic. Culture showed a hæmolytic streptococcus infection, and two days later four incisions were made in the lower hemisphere.

She promptly improved as far as her sepsis was concerned, but the wounds did not heal as they should and from one suspiciously white area a section was made that showed no carcinoma.

About ten days later a second specimen was removed from a place nearer the nipple and carcinoma was definitely found.

During the next three weeks twelve X-ray exposures were given. The inflammatory reaction diminished greatly.

May 24, 1924, a widespread radical removal of the breast, axilla and pectoral muscles with subsequent skin grafting was done.

On pathological examination, numerous mitoses were found in the carcinomatous mass—a point of interest—considering the amount of radiation she had had.

Eight lymph-glands from the axilla that was sectioned showed no evidence of carcinoma. She was discharged twenty-six days after operation in good condition.

The summer passed and it was expected in the fall to see this patient return to the Follow-up Clinic with metastases and beginning cachexia. It was a great surprise to find her in splendid health with 100 per cent. arm function looking extremely well and no clinical evidence anywhere of metastases.

Seven months afterwards, she returned to the Follow-up Clinic having skipped a period and with the uterus about double its normal size. It was evident she was beginning a pregnancy, and she was advised to have a therapeutic abortion. This she refused to consider, and went through a normal pregnancy, giving birth to a ten-pound baby in August, 1925. She nursed this child five times a day for a short time, did her own housework, and cared for seven children.

She was seen twenty months after operation, looking the picture of health and showed no evidence of metastases.

She is now shown, 1926, almost two years after the operation, apparently in perfect health and with no evidences of metastases. This case is presented because:

1. Occasional importance of history in carcinoma of breast, in spite of the disregard of the patient's story, one is frequently justified in assuming in this disease.

2. Difficulty of recognition of cancer when infection is present.

3. That cancer with infection in a young woman cannot be assumed to have involved the axillary glands, even though they are palpable.

4. That not only was lactation and infection in a young woman, factors frequently considered more likely to render cancer of the breast more rapidly fatal—but a second pregnancy and subsequent lactation, experienced with apparently no ill effect whatever.

5. That X-ray radiation seemed to have helped the inflammatory reaction. Whether it in any way modified the course of the cancer, no one can tell. Probably not much, if at all.

6. That the more one sees of cancer of the breast, the more is one astonished at the remarkably unexpected happenings that occur in individual cases. Accordingly prognoses are almost futile.

7. In addition, Maud Slye's mouse experiments are of interest. In the *Journal of Cancer Research,* vol. v, January, 1920, No. 1, "Relation of Pregnancy to Tumor Growth," we read . . . "two facts stand out with startling clarity and cannot be gainsaid, *viz.:*

"1. Reproducing females grow much less tumor than do non-producing females of the same approximate age and general metabolic condition.

"2. Reproducing females grow much less tumor while they are reproductive than they do while they are non-reproductive; in other words, *when a*

mouse is producing embryos, she is not producing tumor in anything like the amount which she grows while non-reproductive."

CONCLUSIONS

"1. Cancer and reproduction, both being growth processes, draw upon the same energy residuum and are made possible by the same food. Hence the food and energy used by one are withheld from the other.

"2. Therefore (a) if the female is constantly pregnant, energy and food are withheld from the tumor and it grows with extreme slowness. (b) If there is a hiatus between pregnancies, or a termination of pregnancy, the energy which was running into reproduction is released and diverted into tumor which grows very rapidly. (c) If tumor growth considerably antedates impregnation, the currents of energy are already being used for tumor growth and are with difficulty diverted for pregnancy, probably never wholly so.

"3. Hence, when a female is well advanced in tumor growth before impregnation there are rarely any offspring brought to birth. When offspring are delivered they are few, small, undernourished, and rarely suckled (which in mice means there is no lactation).

"4. When tumor growth is not interfered with by pregnancy, it is (a) extremely rapid in mice which are young, well nourished and vigorous; (b) less rapid in mice older and less vigorous, or less nourished; (c) very slow in mice which are old, feeble, under nourished, or afflicted with a destructive complicating disease.

"5. Another point which shows the close relation between the growth of embryos and the growth of tumor is the great frequency with which breast tumors are nearly synchronous with delivery. Hyperstimulation of any tissue seems to originate cancer of those tissues in individuals of cancer tendency; hence the intense stimulation incident upon lactation tends to originate cancer of the breast in individuals of breast cancer tendency.

"6. The prolonged hiatus between pregnancies greatly complicates the study of the relation between pregnancy and tumor growth in the human species. During this prolonged hiatus the tumor may draw off the energy which would have continued to be used in reproduction if the pregnancies were not widely separated, just as is the case in mice kept constantly impregnated. This would account for any apparently conflicting testimony in human experience as compared with these studies.

"The factors are not subject to control in the attempt to study the relation between reproduction and tumor growth in the human species, and the conclusions have to be drawn without knowledge of complicating factors. The real relation between these two can be disclosed only in the experimental laboratory, where the factors are all known and are under control.

"The experimental evidence shows a very striking relation between these two modes of growth, the production of young and the production of tumor; moreover, it shows the same relation between the production of young, and the growth of *all types* of mammary gland tumors."

AXILLARY DISSECTION IN THE RADICAL OPERATION FOR CANCER OF THE BREAST

Doctor John E. Jennings read a paper with the above title, for which see page 770.

Doctor Howard Lilienthal said that he had felt that the skin of the axilla is usually involved late because the lymphatics are deep and close to

the vein, beneath the costocoracoid membrane. Therefore, he had dissected the breast and axillary contents *en bloc,* but had not removed the axillary skin unless it was adherent to the disease, in which case he had removed it. He wished to ask Doctor Jennings if, in his early cases in which he found a doubtful involvement of the axillary nodes on clinical examination, he would plan an operation in this way. It seemed to the speaker that there must be greater tension in drawing this kind of wound together than when the operation was done in the usual way.

Doctor Robert T. Morris said that he was at work with Heidenhain at the time when he made his study of cancer of the breast and found that the minor pectoral muscle and the skin were involved rather later. On a basis of that idea, C. E. Ruth turned the lesser pectoral muscle into the axilla to avoid scar contraction. The speaker had often done the Ruth operation in early cases, but not in late ones. In the latter he preferred to make use of a fat graft taken from the other breast by preference. Doctor Morris felt that skin removal depended much upon the stage of the disease.

Doctor Burton J. Lee said that he would like to ask Doctor Jennings if most of the skin recurrences in his cases had not occurred over the latissimus dorsi tendon rather than over the anterior portion of the axilla. He had found many recurrences in that part of the axilla so that he frequently has extended the dissection posteriorly if he expected a node there. He had felt that by this procedure he had avoided some recurrences.

Doctor Joseph Wiener said that his reaction to this operation was that of Doctor Lilienthal. In many cases removal of the skin of the axilla has developed, pressure symptoms and often enormous lymphœdema, much more so than with any other operation. This is a very serious matter to the patient. He had one patient who for fifteen years after a breast amputation complained continuously of enormous lymphœdema of the arm.

Doctor George H. Semken said that if the recurrent cases are studied one can learn what should be removed at the primary operation. It was a question, in his mind, whether the pictures shown on the screen represented actual skin permeation by cancer rather than outward invasion by cancer in the lowest group of breast axillary nodes for the low cases, and by cancer in the lymphoid tissue under the axillary hair follicles for the high cases. If the posterior breast skin flap is dissected so thin that it is widely free from the lowest group of axillary nodes, and if the lymphatic tissue under the axillary hair follicles is carefully removed from the flap, these danger points may be avoided. The clusters of metastases that are found about scars usually indicate an insufficient removal of breast-skin, but some are probably implantation metastases. In the axillary dissection it is a wise plan to remove the outer half of the sheath of the axillary vein as a routine procedure. Observation of recurrences in the axilla shows these to be closely attached to the sheath. A simple gauze dissection will not remove all of this axillary lymphatic tissue, but the removal of the sheath of the vein, which is not a difficult matter, will certainly accomplish this. It has the added advantage

of completing the intact fascia envelop, which should enclose the removed axillary fat and lymphatic tissue.

Doctor Eugene H. Pool said that his reaction to this procedure of Doctor Jennings' was that of the other speakers in the discussion. In reading Doctor Jennings' paper he felt that if there were skin involvement in the axilla the procedure would not do any good, and if there were no skin involvement in the axilla the procedure would be unnecessary. Moreover, on anatomical grounds there seemed little reason for it because the lymphatics from the mammary gland pass to the axilla in the deeper tissues and not immediately beneath the skin. Doctor Pool stated that one important feature in Doctor Jennings' paper had not been discussed, namely: 66 per cent. of three-year cures. Doctor Jennings' careful follow-up system makes these figures especially convincing. The conclusions of one who can report such results demand serious consideration. To attain such results his operations must be very well done and Doctor Pool was inclined to ascribe the success to features other than the skin incision.

Doctor Jennings said that in his opinion the point of the whole thing was that in cases in which the skin of the axilla is adherent to a growth underneath, it is too late to do anything more than to give palliative treatment. It is the case in which no evidence of cancer beneath the axilla is to be seen which should have wide skin removal. One could not formulate rules as to the involvement of the axillary skin any more than one could for involvement of the lung or liver. As to Doctor Morris' suggestion regarding fat transplant, the speaker tried this in one case and lost the graft and had not tried it since; he expected, however, to make the experiment again some time. There need not be great tension on the skin if the skin is sutured with the arm up.

With regard to biopsy, Doctor Jennings had formerly agreed with Doctor Pool that there is a great deal to be said. A few years ago he believed that it was only fair to incise a doubtful tumor rather than to proceed immediately with radical operation and he followed this procedure for a year or two. Three of his cases recurred, however, two in the brain in six months and one with multiple metastases in the long bones. This might have been a coincidence, but he thought it better not to stick knives into doubtful cases. Regarding the inflammatory type that subsided under the X-rays, it might be possible to do a biopsy after vigorous radiation, or it might be better to do a radical operation now that the inflammatory condition has been entirely controlled by radiation. Biopsy, however, is dangerous.

Stated Meeting Held March 24, 1926

The President, Dr. Walton Martin, in the Chair

AVULSION OF SKIN OF ABDOMEN AND PART OF SCROTUM

Doctor Fenwick Beekman presented a boy, twelve years of age, who September 15, 1924, was admitted to Lincoln Hospital, having been hit by an automobile.

AVULSION OF SKIN OF ABDOMEN AND PART OF SCROTUM

The skin of the abdomen, from the level of the umbilicus and extending from crest to crest of the ilia, had been torn off in an apron-like fashion, the remaining edges were undermined for several inches on each side. The skin of the scrotum on the left side had been torn off as far back as the perineal body. The skin of the penis had separated at the base of the organ and hung over the glans penis, turned inside out like a glove finger. The right side of the scrotum was also turned inside out and the right testis covered with its superficial layers of fascia was exposed. The left testicle had been stripped of all tissue down to the vaginal process and was entirely free except for its attachment by the cord at the external inguinal ring. The crest of the right ilium was fractured as well as the pubic bone.

Two hours after admission the patient was taken to the operating room and given a general anæsthesia. The wound and surrounding skin was thoroughly cleansed with soap and water and the skin was painted with a 5 per cent. alcoholic solution of picric acid. The wound was thoroughly debrided and counter-incisions for drainage were made in the dependent parts where the skin edges had been separated. The skin was replaced over the penis and the right testicle was replaced in the scrotum. The problem then arose as to what to do with the left testicle. If it was not taken care of it would undoubtedly become infected and slough, so it was decided to bury it under the skin of the left thigh. The skin was undermined and after the testicle had been thoroughly cleansed it was placed in the subcutaneous tissue in about the region of the saphenous opening without tension on the cord. The subcutaneous tissue was sutured to the deeper structures above it. The entire wound was Dakinized. The patient had an uneventful convalescence, October 15, just one month after the accident, the wound was covered with Thiersch skin grafts and November 30 he was discharged, the wound practically healed. Since then he has been perfectly well.

Doctor Beekman presented a case of a solitary cyst in the neck of the left femur. The patient, a girl of six years of age, was admitted to the Surgical Division of Lincoln Hospital, September 11, 1925 in the service of Doctor Frederick W. Bancroft. Five days before admission she fell on a cement floor, striking her left hip. Following the accident she was unable to stand. On admission to the hospital, tenderness could be elicited on pressure over the trochanter of the left femur. There was no shortening in the limb and there was a full range of motion at the hip. A röntgenological examination three days later showed a bone cyst of the neck of the femur with a pathological fracture through it. There was no displacement.

The patient was kept in bed without splints. One month after admission, under a general anæsthesia, a U-shaped incision was made with its convexity downwards through the skin and superficial fascia, over the trochanter. This flap was raised and the trochanter was exposed by a vertical incision through the fascia lata and tensor fascia femoris muscle. A large drill hole was made in the trochanter in the direction of the plane of the neck of the femur until the cavity of the cyst was entered. The opening was then enlarged; the cyst contained clear fluid and its walls consisted of a spongy-like bone. The cavity was thoroughly curetted and wiped out with pure carbolic acid and alcohol. A vertical incision was then carried down the side of the thigh for three inches from the lowermost portion of the first incision, splitting the fascia lata. A flap of muscle three-quarters of an inch wide and about one and a half inches long was raised from the under surface of the fascia lata, leaving it attached at its upper end. This was placed in the cavity of the bone and was held there by suturing the rent in the fascia lata with

chromic gut. The skin and superficial fascia were closed with silkworm gut sutures. The wound healed by primary union. Cultures from the cyst showed no growths. X-rays taken at frequent intervals following operation showed a progressive process of new bone formation within the cavity of the cyst. It was not thought that the muscle flap entirely filled the cavity, but it appeared to act as a cork and the new bone was probably laid down in the sterile blood clot beyond the flap as well as in the flap itself.

Bloodgood (*South. Med. Jour.*, vol. xiii, pp. 888–897, December, 1920) has recently reported fifty cases of solitary bone cyst eighteen of which were in the shaft of the femur. He states that these cysts predominate in the long pipe bones, preferably the femur, and he further says, "in the femur its most common situation is in the shaft. I have never observed it in the trochanter, neck or head of the femur." This case, therefore, is interesting because of the location of the cyst. It is well known that most of these cases would be overlooked if pathological fractures did not so often take place. The cause of the cyst is probably of inflammatory origin and Bloodgood says that they will all in time cure themselves. He does not advise operation except as an exploratory measure.

LONG-STANDING ULCER OF THE STOMACH

Doctor Fordyce B. St. John presented a woman, aged fifty-nine years, who was admitted to the Presbyterian Hospital, January 23, 1923 (a little more than three years ago), with the history, that at the age of nineteen (1886), she began to have abdominal pain, soon followed by nausea and vomiting, which persisted more or less constantly from that time until the date of her admission to the hospital, a period of thirty-seven years.

Fig. 1.—Diagram showing location of stomach ulcer.

At the age of thirty-seven (1903), she had entered a hospital in Germany for relief of this abdominal pain, nausea and vomiting. The pain had increased in severity and the patient had been confined to her bed for two months previous to going to the hospital. She was operated upon at this time by Doctor Paul Wolfe, of Hamburg, who, in response to a letter of inquiry, stated that he operated Mrs. B. for an ulcer of the stomach, which had penetrated deep into the liver. He loosened the stomach, excised the margins of the ulcer, and sutured it. The patient had a smooth recovery. After this first operation she remained in the hospital for three months and then returned home to convalesce. She was followed by her surgeon for a period of two years.

At the age of forty-seven (1913), she returned to the United States,

where she was again operated upon for relief of severe abdominal pain, associated with nausea and vomiting. The report of this operation is as follows: "The diagnosis in the case of A. B. was gastric ulcer (of the posterior wall of the stomach at the lesser curvature) with adhesions of the stomach to the anterior abdominal wall, liver and pancreas. The operation consisted of an anterior gastro-enterostomy and division of adhesions." Following this procedure, she was relieved for a period of a few months, after which the symptoms recurred.

At the age of fifty (1916), she came to the Presbyterian Hospital with the same symptoms again, especially severe in character. The operation then performed, revealed the following pathology: Extensive adhesions of the omentum to the anterior abdominal wall and to the anterior wall of the stomach. The stomach was also adherent to the under surface of the liver. Four or five centimetres from the pylorus, there was a marked kink of the stomach, and a constriction which seemed to run vertically. Scar tissue on the anterior wall seemed to indicate the presence of an old ulcer. It was at this site that the adhesions were most dense. On the inferior portion of the stomach, the gastro-enterostomy was present and seemed patent. It was surrounded by adhesions. The operation consisted of division of adhesions.

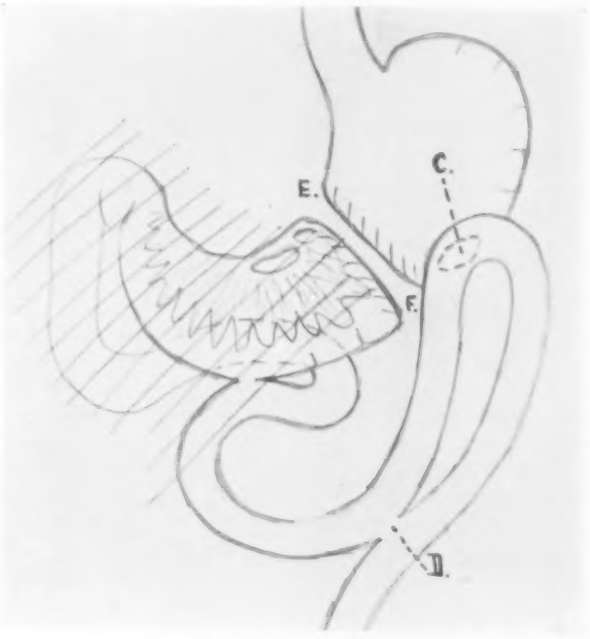

FIG. 2.—Diagram showing elimination of ulcer-bearing portion of stomach from digestion.

The patient received some relief from this procedure, but again it was only temporary, and the pain increased in severity during the two years before her next admission. When the reporter saw the patient at this time, she was having severe abdominal pain relieved by food, which she was taking at two-hour intervals. She was vomiting two or three times a week, and was altogether very miserable. An X-ray of the gastro-intestinal tract revealed the presence of an ulcer—or ulcers—on the lesser curvature, with marked deformity of the pars media.

Because of the severity of the symptoms, exploration was decided upon, it being felt that resection of the ulcer-bearing area of the stomach would be the most satisfactory procedure for the patient if this were technically possible. There was some doubt as to this procedure being possible because of the direct evidence, already obtained, of very extensive adhesions.

The operation was performed on February 2, 1923. A left rectus incision was made lateral to the previous scars, with a transverse extension to the left. With difficulty the proximal portion of the stomach was exposed by carefully

dissecting through adhesions intimately attaching stomach, transverse colon and omentum to the anterior parietal peritoneum. Extensive induration was present on the distal third of the stomach, especially in the region of the lesser curvature, through which the larger of the craters was distinctly palpable, and a lesser crater appreciated, though not as clearly. The entire pylorus was intimately adherent to the anterior parietal peritoneum, and to the under surface of the liver. It was found that the preëxisting gastro-enterostomy was retro-colic, but attached to the anterior wall of the stomach. The stoma was apparently patent, less than 1 cm. in diameter. It was deemed wise to begin the procedure of exclusion by sectioning the stomach at the junction of the upper third and lower two-thirds, well above the incisura angularis, and if the patient's condition warranted, an attempt at resection of the distal portion of the stomach, embedded in adhesions, might be made, with the closing of the upper gastric pouch, and performing an anterior long-loop gastro-jejunostomy.

Two hours having been consumed in the operative procedure, an attempt at resection did not seem justifiable, considering the extent of the pathology; the upper end of the distal gastric pouch was therefore closed, with layer sutures, thus eliminating the ulcer-bearing area from direct digestion, accomplishing anatomical exclusion without subjecting the patient to a prolonged procedure, the feasibility of which was questionable.

The post-operative course was uneventful, except for a rise of temperature to 103 degrees on the eighth day. The temperature immediately dropped to normal on the tenth day, and the patient was discharged on the twentieth day.

At the end of twelve months the woman was working as a practical nurse, eating everything. She had no pain, gas, heartburn, nausea or vomiting. Her bowels were moving regularly without medicine. An abdominal examination was essentially negative, except for the old diastasis of the recti just above the umbilicus.

At the end of twenty-four months, she was again having abdominal pain which had existed for two weeks, associated with very severe constipation, the bowels not moving in three or four days.

She promptly returned to normal in a week, as a result of rest, proper care of the bowels, and a carefully selected diet. Gastro-intestinal X-ray examination revealed the following: "at a point at the level of the entero-enterostomy there seemed to be some narrowing of the efferent loop of the jejunum." This disappeared, and at the end of three years after operation, the patient is active, apparently well, and is eating an unrestricted diet without nausea, pain, or vomiting. She occasionally belches gas.

Doctor Richard Lewisohn remarked that this case demonstrated very well the unfortunate results of conservative surgery in these ulcers. One so often hears the advice to do the simpler operation first and the radical later when the necessity should arise. Of course, in this case no one can blame the surgeon for doing a conservative operation, for the primary operation was performed thirty years ago. The complete operation (subtotal gastrectomy) should be done as the first procedure. This patient has had three operations so far, extending over a period of thirty years, and it is doubtful whether she is cured.

LATE RESULT OF BILIARY FISTULA WITH IMPLANTATION OF FISTULOUS TRACT INTO STOMACH

Doctor Fordyce B. St. John presented a man, thirty-one years of age, who was admitted to the Presbyterian Hospital, April 5, 1924, with the history that two months previously he began to feel badly, with loss of strength and appetite. He became jaundiced, and had clay-colored stools. He went to an osteopath, who gave him very strenuous manipulation, in the course of which he "pummelled him in the region of the liver." The following day, he had severe, sharp pain in the right upper quadrant, going to the

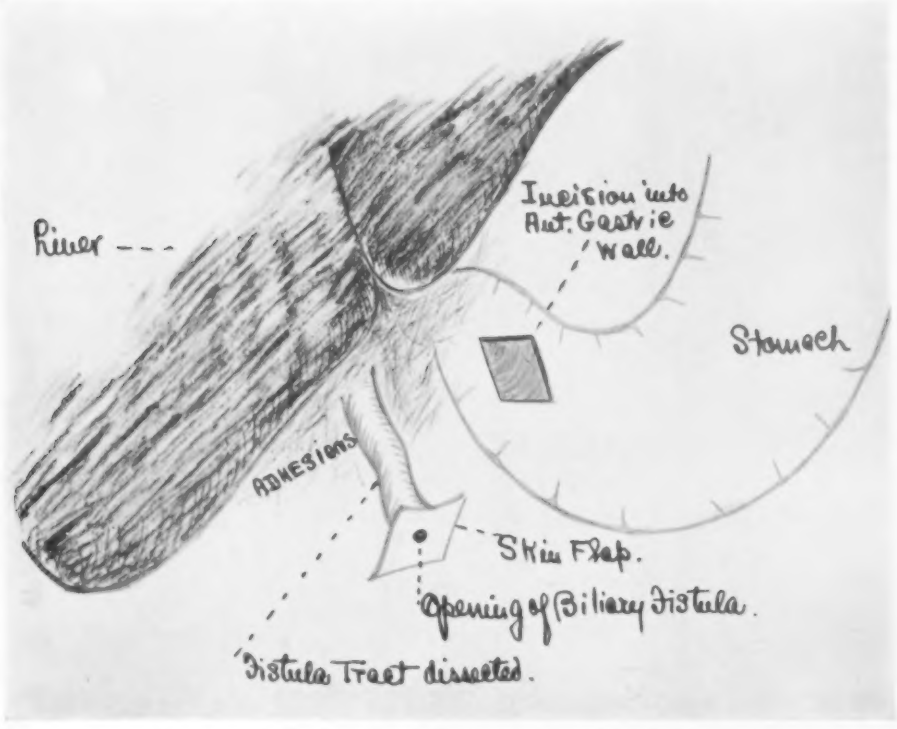

Fig. 3.—Implantation of biliary fistulous tract into stomach, first step.

back. He vomited two or three times. He remained in bed about a week, and then gradually felt somewhat better.

One month before admission he began to have recurrence of the pain in the right upper quadrant, unassociated with nausea or vomiting, but associated with light-colored stools.

Two days before admission he had a severe attack of pain in the right upper quadrant, radiating to the back.

On admission, he was slightly jaundiced, uncomfortable with pain, and there was considerable muscle spasm in the epigastrium and right upper quadrant. His temperature was 99 degrees, pulse relatively normal, respiration 24. White blood cells, 13,500; polymorphonuclears, 76. There was a trace of bile in the urine. A diagnosis of "acute cholecystitis" was made and an operation performed.

There was marked distention of the gall-bladder, which was gray in color with fibrin on its surface and apparent œdema of the wall. No bile

was present in the peritoneal cavity. The gall-bladder was so large and tense that it was aspirated several times before removal, the latter being accomplished by dissection from the fundus toward the cystic duct. The cystic duct was inspected, but did not appear enlarged and no calculi could be palpated along its course. During the removal of the gall-bladder some difficulty was experienced with oozing from a small vessel in the vicinity of the cystic artery, but near the common duct. This was clamped and ligated with the common duct in view, and apparently not compromised. A cigarette drain was placed down to Morrison's pouch and the wound closed.

Pathological examination of the gall-bladder revealed a wall 6 or 7 mm.

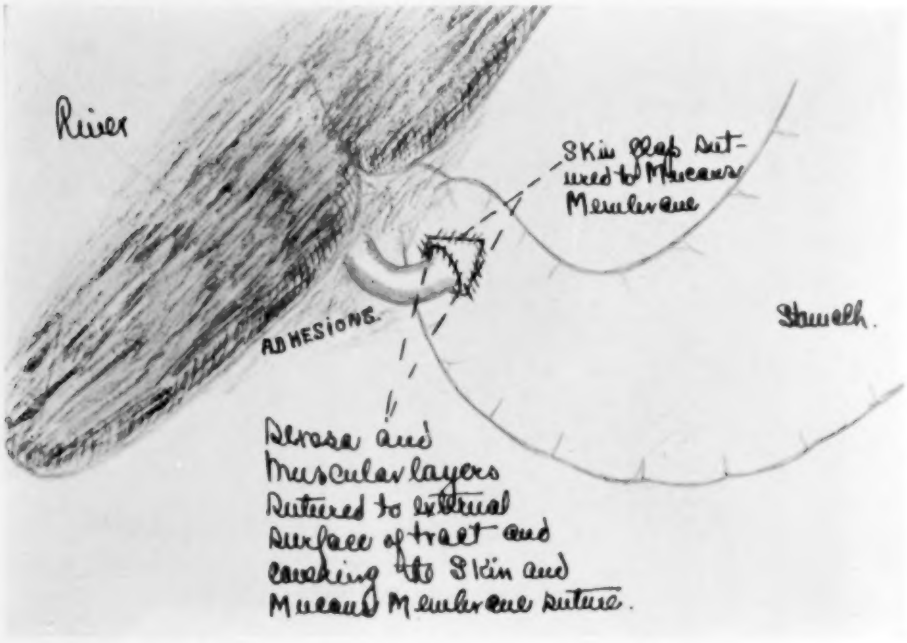

FIG. 4.—The implantation completed.

thick, with no calculi present. The mucosa was destroyed, its place being taken by fibrin. There was extensive blood extravasation in the submucosa, with some œdema and leucocytic infiltration. The subserosa was enormously thickened by œdema and fibroblast infiltration. It was evidently an acute exacerbation on top of an old chronic cholecystitis.

Post-operative course: The patient developed post-operative pneumonia which he handled well. On the second day the dressing of the wound was inspected, with evidence only of dry serum. On the third day, up to which time he had been definitely jaundiced, the dressing was soaked with bile. From this time on, the biliary fistula persisted, and the stool was repeatedly negative for bile, until the patient was given his own bile by mouth, which he took for a period of five weeks.

On the eighty-sixth day after operation, a second operation was performed, at which the following pathology was noted: The great omentum and transverse colon, the liver, duodenum and stomach were adherent. A probe introduced into the mouth of the sinus passed down immediately beneath the inferior surface of the right lobe of the liver, where the sinus

tract was lost in dense adhesions. The pre-pyloric region of the stomach was visible and the duodenum was not. A decision was made to dissect the distal portion of the sinus, including the surrounding skin for about 1 cm. in all directions, and implant this into the pre-pyloric segment. This was done after making a longitudinal incision in the anterior wall of the stomach, about 3 cm. in length, and suturing the mucous membrane to the skin margin of the sinus, throughout its entire extent. Musculature was later repaired to the margin of the sinus tract, and a bit of the great omentum lightly sutured over the anastomosis. The wound was closed without drainage.

The post-operative course was uneventful. There was no leakage of bile at any time. The wound healed by primary union, and the patient was discharged twenty-six days after the last procedure, bile having been present consistently in the stool, after operation, and there having been no jaundice.

One year after the second operation, the patient had gained sixty pounds. He was symptom-free, was having no indigestion, his appetite was excellent, and his bowels were moving daily without medicine. There had never been a suggestion of jaundice.

Now, twenty-one months after the second operation, the patient is symptom-free, his appetite is excellent, and he is eating everything. He has not lost a day's work in sixteen months.

Doctor Hermann Fischer said that almost every surgeon who does a large amount of gall-bladder work has at some time encountered annoying hemorrhages from large cystic arteries or irregular branches of the cystic and hepatic arteries. These hemorrhages are, under certain conditions, very troublesome and very often the cause of injuries to the hepatic or common duct, these structures being caught by clamps or ligatures in the endeavor to stop the hemorrhage in an operation field obscured by bleeding. There is a simple method to control such bleeding immediately and with certainty. This consists in compressing the structures which run in the hepato-duodenal ligament by inserting the index finger of the left hand into the foramen of Winslow, hooking it up and thereby putting it on the stretch. By doing this the hemorrhage can be stopped immediately, the operative field wiped clean from blood. By relaxing the pull somewhat, one is able to see the bleeding artery and can clamp it without injuring the neighboring structures. He had not seen this simple measure described in the text-books and he thought it might be worth while to mention it. The method helped him out of a predicament in a case in which he had just tied a cystic artery of about the size of a goose-quill. The patient took a very bad narcosis, for some reason or other the ligature slipped just at the time when the patient stopped breathing. It was indeed, a very disagreeable situation, which, however, was successfully overcome by this little trick.

MULTIPLE FRACTURES IN CHILD. PYEMIC ORIGIN (?)

Doctor James I. Russell presented a baby, aged six months, who was admitted to Roosevelt Hospital, October 25, 1925, with the history that it had been quite well until three weeks before admission, when he cried continually without apparent cause. It was then noticed that there was slight swelling and redness about the middle of the left lower leg. Shortly afterwards there was a similar swelling and redness near the lower end of the

right forearm. The right lower leg and the left forearm followed in turn with slight redness and abnormal mobility. The parents were told that the child had fractures and splints were applied. The area of redness and swelling in the right forearm increased and an incision was made on the volar surface near the wrist with evacuation of pus. At time of admission to the hospital there was a discharging sinus in the right forearm at the point of this incision. There was no definite history of trauma. The child's general condition had been good up until the present illness. He was breast-fed for two weeks, supplementary feeding about four weeks longer, and then a bottle-fed baby.

The weight was fourteen pounds on admission. At time of admission the child was an ill-nourished, pale baby with a temperature of 102°, white blood cells 29,000, red blood cells 3,840,000, hæmoglobin 60 per cent. Blood smear was normal, except for the pale staining. No abnormal forms of the blood cells. Wassermann was negative. Von Pirquet negative. Blood culture was sterile.

X-rays demonstrated oblique fractures in both tibia with good apposition and good repair. Plates of the right forearm showed fractures of both the radius and the ulna with some loss of substance. Plates of the left forearm showed fracture of the upper third of the radius. The lungs and pleura were negative, heart normal. The rib ends, as well as some of the epiphyseal lines in the long bones showed suggestive Ricketic changes. X-ray of the skull showed no changes.

A red, tender area of the left forearm developed and at the same time swelling of the right supraclavicular region. These increased in size and were incised two weeks after admission. Culture of these showed non-hæmolytic streptococcus.

The temperature ranged between 102 and 101° plus for one week after admission, then shaded off, with slight elevations until opening of the abscess, two weeks after admission, and from then on there were slight elevations from time to time. The wounds healed promptly without drainage.

Alpine light exposures were given every day during his last two months in the hospital.

Upon discharge, four months after admission, all fractures were firmly united, weight was nineteen pounds, four ounces.

Five days ago the child slapped his father, causing a re-fracture of the right forearm. Since his discharge from the hospital he has continued to gain weight. The position of both bones of the right forearm is good, which is maintained with anterior splints.

ACTINOMYCOSIS OF ABDOMEN

Doctor James I. Russell presented a woman, twenty-six years of age, who was admitted to hospital, March 7, 1924, with a history that one year ago she had an attack of lower abdominal pain, which illness continued for several weeks until finally an abscess ruptured, discharging through the rectum. After this she had been well until two weeks ago, when pain appeared in the lower abdomen. A few days afterwards a swelling apppeared in the left inguinal region which had gradually increased.

Examination showed a definite localized swelling in the left lower abdomen just above Poupart's ligament. The skin was red, tender and fluctuant. This was incised under gas, oxygen. There developed a sinus which continued to discharge when she returned to the hospital, three months later, for further examination.

No further operation was done at this time. Two months later the patient reëntered the hospital, the process having extended with blotchy indurated areas over the buttock with points of fluctuation, suggestive of actinomycosis.

A second operation was then done and the greater portion of the tissue over the left buttock was excised, incision extending down through the abdominal wall over the crest of the ilium connecting up the original sinus. The ray fungus was demonstrated in the tissue and in the discharge at this time.

She was treated with solutions of iodine locally and with increasing doses of iodide of potassium.

Four weeks after the operation X-ray exposures were given at stated intervals. These were continued from time to time during the process of the healing. The wounds improved greatly, healed, and have remained closed for the past fourteen months. Her health has greatly improved and she has gained about thirty-five pounds.

Doctor Walter M. Brickner said that this case might be classed with the group of five cured cases which he had reported under the title of "pelvic actinomycosis"—although he believes that their origin is abdominal, that is intestinal. It has been shown that actinomycetes may pass through the intestinal wall, leaving no trace, and it has also been found, as was well demonstrated in one of Doctor Brickner's cases, that an intestinal actinomycosis may completely subside while the disease is spreading to other tissues.

In his cases potassium iodide did not exercise any demonstrable benefit, even though given in huge and persistent dosage, nor did he observe that iodine locally, copper sulphate, etc., were of specific benefit. In four of his five cases the cure was due to bold and persistent surgical attack. In the more superficial cervico-facial and buccal actinomycosis potassium iodide, copper sulphate, X-rays, radium, salvarsan and vaccines have all given some very satisfactory results, usually in association with surgical evacuation. In deeper-seated, visceral actinomycosis, however, these measures are of doubtful helpfulness. Many cases are reported as having taken potassium iodide "pound after pound and month after month" without benefit. It must be remembered, too, that occasionally actinomycosis undergoes spontaneous recovery and, rarely, even pulmonary actinomycosis is cured by expectoration.

The "sulphur granule" is a diagnostic fetich! Its appearance in the pus is so vagarious that if one insists upon finding these bodies in order to establish the diagnosis, he may sometimes have to wait for an autopsy in order to do so. These granules may disappear from the pus after a few weeks and not again be found therein, or they may be found only in the solid tissues, or they may not appear in the pus for many months. From the clinical side, too, one can make no distinction between those lesions showing only mycelial streptothrix and those showing typical ray fungus and sulphur granules, to which Wright would limit the disease *actinomycosis hominis*. One should be prepared to make a clinical diagnosis of actinomycosis when the history, the appearance and, sometimes, the odor, are characteristic.

LATE RESULT OF OSTEOCHONDROMA OF RIB

Doctor John C. A. Gerster reported the case of a man, well eight years after operation for a large osteochondroma of the ribs, developing after trauma. There were bony exostoses of humerus and tibia of over forty years' standing. He presented himself April 26, 1918 with the following history:

In July, 1917, he accidentally struck the left lower part of his thorax. Three months later, the injured area became swollen and for the past nine months increase in size had been marked. Some abdominal discomfort after meals for the past eight weeks. Examination disclosed a large flat tumor, the size of a man's hand, involving the left lower thoracic wall from just in front of the nipple line to behind the posterior axillary line. The lower margin corresponded with the free margin of the ribs. The surface was flat, smooth and raised fully an inch above that of the adjacent chest wall. The overlying skin was tensely drawn. There was a sense of elasticity over the centre; the margins were hard, smooth, and fixed to the ribs. It was flat to percussion. There was no tenderness. X-ray showed a tumor mainly intra-abdominal, nine-tenths of which lay internal to the lower bony thorax. In addition to this tumor of the thoracic wall, there were exostoses of the right humerus and right fibula, noted since the ages of twenty-two and eighteen, respectively. The rest of history and physical examination revealed nothing abnormal.

Operation April 30, 1918, consisted of excision of an osteochondroma on the left side, involving the ninth, tenth, eleventh and twelfth ribs, and lower chondrocostal margin. From the moment of opening the pleural until closure of the chest, intrapharyngeal narcosis was employed, using small quantities of ether in addition to nitrous oxide and oxygen. Respirations were quiet, the color was good and the pulse did not rise above 90. The skin incision, including subcutaneous fat, began in front in the median line about three fingers below the ensiform, then ran backward along the lower margin of the tumor almost to the vertebral column. This large flap was then dissected upwards to well above the upper margin of the tumor. The abdominal wall was now divided by a transverse incision along the left costal margin and, by introducing the hand one could feel the coral-like surface of the intra-abdominal portion of the tumor which was the size of a grape fruit. There were no adhesions. Beginning at the posterior angle of the abdominal wound, one-half inch behind the tumor, one inch of the twelfth, eleventh, tenth and ninth ribs was resected. The intercostal vessels were ligated before being divided. This permitted the hand to be inserted into the thorax to determine the upper margin of the tumor. The soft parts of the eighth interspace were divided as far forward as the anterior margin of the tumor, where the costal cartilages were divided, thus completing the division of its parietal attachment. It was now free except for diaphragmatic attachment. This was severed close to the tumor, completing the removal. The left lung, and pleural cavity and pericardium appeared normal. There were no secondary chondromatous deposits.

The abdominal cavity was closed by uniting margins of diaphragm to abdominal wall, under considerable tension. This was partly relieved by incising upper surface of diaphragm parallel to its free margin and transversely to muscular fibres, but not dividing subdiaphragmatic fascia. The left pleural cavity was closed by turning down the skin and subcutaneous flap and suturing the fat to the upper surface of the diaphragm two and one-half inches or three inches above the flap's cut edge. This left subcutaneous fat in contact with the lung for a space of three inches long by one and one-half

inches wide. Skin edges were approximated with a running suture of silk and a dry compressive dressing then applied.

The specimen measured sixteen and one-half by twelve and one-half by eleven and one-half cm. It weighed 1200 grams. The abdominal aspect was stony hard and covered with numerous coral-like excrescences. The external surface was smooth and fluctuating. Incision into this revealed cartilaginous tissue with numerous spaces filled with clear, slightly yellowish mucoid fluid. Through the midst of the tumor passed several ribs and their cartilages. Microscopical examination proved the tumor to be an osteochondroma. Convalescence was uneventful. There was some effusion in the left pleural cavity for a few days after operation. A slight marginal necrosis of the skin developed along the lower border of the large skin flap, one-half inch wide and four inches long. The patient was discharged on the twenty-sixth day after operation. X-ray showed a poorer aëration of the left lung than of the right. Since then the patient has been enjoying good health except that he is somewhat short of breath upon exertion. It is now one month less than eight years after operation. There are no signs of local or general recurrence.

MASSIVE GASTRIC HEMORRHAGE TWENTY-SEVEN MONTHS AFTER FINNEY PYLOROPLASTY

Doctor Gerster presented a man, forty-seven years old, who was first admitted to the Lenox Hill Hospital, service of Doctor DeWitt Stetten, July 4, 1922, with an acute perforated gastric ulcer of six hours' standing. The perforation involved the anterior stomach wall one inch proximal to the pyloric ring and was closed with a single mattress suture of heavy silk. Uneventful recovery followed, and he was discharged on the eighth of August, 1922. August 11, 1923, he returned with symptoms of marked gastric retention, and much loss of weight. X-ray examination revealed large twenty-four-hour retention of bismuth. At operation, August 16, the scar of the old perforation was barely visible, it showed no induration and the silk suture could be seen and felt beneath the peritoneum. The pylorus was extremely small but not scarred. In the course of a typical Finney pyloroplasty, when the stomach and duodenum were opened, the gastric wall was everted and the former site of perforation could not be seen or felt in the mucous membrane, which appeared entirely normal. He made an uneventful convalescence in spite of dietetic indiscretions, for example, eating one-half pound of rock candy on the fourth day after operation. On the eighteenth day after operation, X-ray showed the stomach completely emptied in three and one-half hours. He was discharged well on the twenty-first day, September 5, 1923. He gained nearly thirty pounds within a month.

January 9, 1926, he presented himself, saying that he had been entirely well until thirty-six hours before, when he suddenly felt pains in the epigastrium identical with those he had experienced prior to the perforation of his ulcer. These pains had lasted up to within a few hours of his application for advice, and then suddenly ceased. Physical examination revealed nothing abnormal. Twelve hours later, he came into the hospital because of a massive gastric hemorrhage. Under conservative treatment, including Sippy diet, he recovered and was able to leave the hospital January 30. X-ray at this time revealed rapid emptying of the stomach which began immediately upon ingestion of barium. There was some slight deformity of the duodenal cap attributable to pyloroplasty. No local tenderness.

It is to be noted that the patient prior to his hemorrhage had been working very hard, at least sixteen hours a day, for several months. Whether the

strain of this was a contributing factor in the occurrence of his gastric hemorrhage, must at least be considered.

Doctor Richard Lewisohn said that the massive hemorrhage was undoubtedly due to reactivation of the old ulcer or to a new ulcer which had formed. This patient may have a new ulcer in the duodenum or in the antrum. The Finney operation can only be used in a certain number of cases where the ulcer is situated on the *anterior* wall of the duodenum and this location is only encountered in one out of three patients. Even in cases where the ulcer is easily excisable and the Finney can be performed, it is doubtful whether the late results are very good. In some of these cases the results were excellent, but in many the operation was a failure. The ideal operation for cases of duodenal ulcer is sub-total gastrectomy.

Doctor Gerster rejoined that all these cases could not be put into one category. He felt that he would rather divide his surgical procedures into two or three stages and have a living patient than to always perform a primary radical operation and risk losing the case. He had considered resection in his case but felt that this was only advisable on theoretical grounds and that it was better to give the man a chance for spontaneous recovery. If he has a recurrence he can still be operated upon and he is being kept under observation.

BRONCHIECTASIS WITH THORACIC FISTULA

Doctor Howard Lilienthal presented a man, who came to him when he was twenty-seven years old, in January, 1924. He was suffering from a characteristic putrid lung abscess of the upper lobe fo the left lung, the symptoms of which appeared first about ten days after his tonsils had been removed under ether anæsthesia. Artificial pneumothorax had been induced at another hospital but without any improvement.

When seen by the reporter he was an emaciated septic individual with a fever of 102, expectorating between six and eight ounces a day. There was clubbing of the fingers. The X-ray picture revealed the characteristic appearance of a pulmonary cavity with a fluid line. The cavity was near the anterior chest wall and its centre was about at the level of the third rib in front. This anterior location of these abscesses is different from the location of tuberculous cavities of the upper lobe which begin almost invariably behind.

February 14, of the same year, he operated upon this man at Mt. Sinai Hospital, making an incision over the fourth rib, beginning at the right of the nipple and running toward the axilla parallel with the rib for about four inches. Another incision was made at right angles to this and near its middle downward and backward for about three inches the fibres of the major pectoral were cut across and also some of the pectoralis minor and serratus. About two and one-half inches of the third rib were resected with the periosteum. Then a large aspirating needle was pushed through the indurated tissue into the abscess, withdrawing foul gas and a little pus. The opening was enlarged with dissecting scissors and several ounces of stinking putty-like material were expelled through the wound. The exploring finger revealed that there was still pocketing downward and therefore one and one-half inches of the fifth rib were taken away and the opening in the chest wall was made large as it could be through this exposure. The cavity was packed with rubber dam. Since this time he had followed this patient continuously

and had maintained a fistula which connects with a bronchus. The X-ray pictures now do not show an actual cavity, but here and there are small rarefied areas which indicate a bronchiectatic condition adjoining the general location of the fistula.

The changes of dressings in this case had been rather annoying because the patient who rapidly regained his health and strength wished to go to work and the daily removal of the discharges was troublesome to him. At last a plugged drainage tube was dressed, the plug of which could be removed once a day for purposes of emptying. There is now not a large quantity of discharge and instead of a tube he wears a solid plug made out of a good-sized rubber ligature. This is prevented from slipping into the sinus by a safety pin.

While this is a case in which a cure may be possible through an extensive operation, this man feels well, is strong and able to work and doesn't wish to be operated upon at present. The sinus gives him little trouble. It is dressed with a bit of gauze which is held in place by a piece of elastic adhesive plaster, an ideal method of retaining a dressing upon the chest without the necessity of bandaging and without compressing the healthy side. This same piece of elastic plaster can be used for two or three weeks when it may be replaced by another piece. In order to prevent the plaster from sticking to the gauze, it is necessary to cover this part of the adhesive surface with a bit of the crinoline backing.

The object of using the same piece of plaster for such a length of time is not because of economy, but because it avoids the necessity of irritating the skin by frequent changes.

This plaster the reporter had found extremely useful in many other ways. For example, there is nothing else which is so conducive to the comfort of a patient with any condition in which pain depends upon respiratory motion of the chest. It is valuable in pleurisy. He had found it almost indispensable in supporting the chest and in retaining the dressings following extrapleural thoracoplasty.

It is essential that the ends of the plaster be held by ordinary adhesive strips of the same width so as to prevent the ends from curling up.

A STUDY IN DISINFECTION OF THE HANDS

Doctor Howard Lilienthal and Jerome Ziegler presented a paper with the above title, for which see page 831.

Doctor Alfred S. Taylor said that he had done some experimental work himself on the sterilization of the hands, in which he tested out all known methods, including that with lime and soda. The man who originated that method was Mr. Rauschen, who was a pharmacist and who said the difficulties with it were the result of not using it properly. It is necessary to have crystals of washing soda, and one good-sized crystal with one-half the amount of lime mixed with just enough water to moisten them would be absolutely efficient. If properly used one can get sterile cultures in 95 per cent., and the speaker has done that repeatedly. The prophylactic method of keeping one's hands away from infection is seldom mentioned, but the lack of this is too often seen.

Doctor Walter M. Brickner said that he had recently read the published report of a study of the comparative value of various antiseptics on the skin, in which it was found that the lime and soda method was more

germicidal than tincture of iodine, both on the skin of the field of operation as well as on the surgeon's hands. Doctor Brickner said that he believed the lime and soda method had been abandoned by many surgeons because the odor on the hands is so persistent. To a less extent he found the same objection to iodine on the hands. Used only once a day, however, and merely on the finger tips, it is scarcely objectionable from this standpoint and no doubt kills off many organisms about the nails.

Doctor John C. A. Gerster thought that with the use of rubber gloves, if intact, there was not as much chance of operative infection as there was through inadvertent reinfection after the most thorough scrubbing up. A patch of dry skin covered with soap may be left after the scrubbing up on ulnar side of elbow, or a long-sleeved gown in being pulled on will touch an unsterilized surface. In short, any number of inadvertent contaminations can be seen daily in any hospital, and it is seldom that the operator's hands *per se* are responsible for infection.

Doctor Lilienthal said that he did not deprecate the value of lime and soda; properly applied this method is effective, but it has to be properly applied. On the other hand, the iodine method does not have to be learned and is therefore the simplest method. On the speaker's hands it has not been irritating and lime and soda is irritating, besides having, as Doctor Brickner stated, a disagreeable odor. There is no odor when iodine is removed from the fingers after the first operation. Doctor Gerster's discussion did not apply because the subject of the paper was not on operating-room technic, but on disinfecting the hands. The method has been used by the men working with Doctor Lilienthal for a long time and they have proven to themselves that it is good. Doctor Gerster, however, mentioned one thing which the speaker had referred to when he said one can see dry places on the hands when scrubbing up; one can see black places if one experiments with lampblack and oil which cannot be gotten off with ordinary soap or even with green soap.

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